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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

1916.

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Errata.

Page 1, lines 3 and 4 from top, *for* There are "cernuum" (Cycads) *read* They (Cycads) are cernuous.

Page 1, bottom line *for* cernuum *read* cernuous.

Page 144, lines 13 and 15 from top have been transposed.

Page 156, line 28 from top, *for* Uvaria *read* Unona.

Page 156, line 29 from top, *for* p. 1 *read* p. 4.

Page 165, bottom line, *for* 1857 *read* 1757.

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KEW.

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I.—CYCAS THOUARSII.

O. Stapf.

In a letter to Kew, giving an interesting account of Sir John Kirk's garden at Zanzibar, Miss C. D. M. Thackeray, the present owner of Shamba la Balozi, drew attention to another Cycad besides *Encephalartos Hildebrandtii* (see *K.B.*, 1914, pp. 386-392) also planted by Sir John Kirk, bearing very graceful long fronds with narrow pinnules which are perfectly smooth and lighter in colour than those of the *Encephalartos*. Miss Thackeray adds that the plants occasionally produce seeds, and that the formation of side shoots is uncommon.

This Cycas is repeatedly mentioned in Sir John Kirk's letters, and sometimes called by him the "cernuum cycas," no doubt on account of the somewhat drooping fronds. He became familiar with it in the delta of the Zambesi, where he observed and collected it on the Luabo distributary, and along the coast between the Kongoni and Melambe mouths in 1858 and 1859; but all the specimens he came across there were female. When in 1861 he visited the Comoro Islands he found it growing "anywhere" on Mohilla, and forming stems 15 feet high (letter of 21st April, 1861), and sent excellent herbarium specimens to Kew. In the following year, writing from Johanna in the Comoros, he remarked that this "Cycas is very common on the hillsides, from the coast to nearly 2000 ft. It has a trunk 18-20 ft. high." Writing from Zanzibar in 1877, he says: "We have the *C(ycas) circinalis*? or one like it. It grows nearer us than the *Encephalartos* which comes from the coast some distance off." Then, in 1878, he writes again: "There are 'cernuum' (cycads) at Mombasa, but that is a long way off. However, I will get you a 5 ft. stem, I hope. In the meantime I shall try for our (*i.e.*, the Zanzibar) cernuum Cycas, which may or may

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not be the same as that of Johanna." Sir John did send a plant the same year, but it does not seem to have lived long. He also planted several in his garden in Zanzibar, and some of his observations on the generation of heat in male cones of cycads (*K.B.*, 1914, p. 390) were made on these. The following reference in a letter of March 5th, 1879, is probably to one of them: "I have a splendid *Cycas Thouarsii* 12 ft. high in lovely foliage at my country place." This note shows that he had at last obtained the identification of the plant.

The history, taxonomic status, nomenclature and distribution of the species is to some extent obscure, and it may be useful to set out briefly what is actually known.

The name *Cycas Thuarsii* [*sic*!] appears for the first time in R. Brown's Prodromus (1810), p. 347, in the "Observationes" following the diagnosis of the family *Cycadeae*. A mark of interrogation and the apposition "Indiæ orientalis," are added to the name*. This species and *C. angulata* are compared with *C. circinalis*, "vera," and certain differences in the structure of the seed are pointed out. On the same page under *Cycas* the author, before passing on to the Australian species, says: "Sub nomine *Cycadis circinalis* plures species procul dubio confusae, e vivis solummod extricandae. Duae in India (p. 348) orientali proveniunt, quarum altera *Cycas circinalis vera*, ex synonymo Rheedii, et icone inedità zeylanica Hermanni; altera a planta Madagascariensi D. Du Petit Thuars, vix diversa."

Petit Thouars in his memoir "Histoire des Végétaux recueillies sur les Isles de France, La Réunion et Madagascar" (1804), p. 2, identified as *C. circinalis*, L., the plant to which R. Brown alludes as *Cycas Thuarsii?*. He considered it identical with the *Cycas* he saw in Madagascar, which, he says, is known there as "Samble." His observations on the germination and fructification of the plant were, however, made in Mauritius (l.c., p. 12), and his figures were therefore, at least in part, drawn from specimens growing in that island. According to De Candolle (Prodr. xvi. ii. p. 529) there is in Petit Thouars's herbarium in Paris only one female specimen extant "cum germinatione vel foliis junioribus, sine origine cognita aut schedula auctoris." However that may be, the figures of the male and female sporophylls are sufficient to prove that the plant of Petit Thouars was not the *Cycas circinalis* of India represented by Rheede's Todda Panna (Hort. Malab. iii. tab. 13–21), the accepted basis of Linnaeus's species. L. C. Richard in his great memoir "Commentatio Botanica de Coniferis et Cycadeis," published posthumously by his son Achille in 1826, figures on tab. 25 and 26, under the name *Cycas circinalis*, what is evidently the same plant as that of Petit Thouars. In fact, some of the figures might have been made from the specimens which served Petit Thouars for his illustrations. On the other hand the figures of tab. 24 of the same work represent the true *C. circinalis* and are in fact mostly (figs B-D) copies from Rheede's Hortus Malabaricus.

* India orientalis is frequently used by the earlier authors to include Madagascar and the Mascarenes.

Miquel in 1840, in his "Commentarii Phytographici," p. 127, definitely distinguished the plant of Petit Thouars from the Indian *circinalis*, naming it *C. madagascariensis*. His description is, however, only a condensed circumscription of Petit Thouars's account of the plant. Two years later in his "Monographia Cycadearum," pp. 32, 33, Miquel emended his description from L. C. Richard's description of *C. circinalis* which he thought referred entirely to Petit Thouars's plant. But it has already been pointed out that the habitus figures published by Richard were those of the true *C. circinalis* and so was also the corresponding part of his description. Miquel's emended description of *C. madagascariensis* is therefore wrong to that extent.

In his 'Epicrisis Systematis Cycadearum' (1849)* Miquel, reverting to the species, took up R. Brown's name *Cycas Thouarsii* which he had previously overlooked. The paper contains only a brief diagnosis of the species which corresponds to Petit Thouars's plant. In a paper entitled "Nouveaux materiaux pour servir à la connaisance des Cycadées" Miquel, in 1868†, once more used R. Brown's name in the place of his own name *C. madagascariensis*. Meanwhiie De Candolle had worked out the *Cycadaceae* for the Prodromus (vol. xvi. ii. 1868, pp. 528-547). Following Miquel, he accepted R. Brown's earlier name *C. Thouarsii*, but as he had seen no specimens of the plant and as he was aware of the somewhat contradictory evidence contained in the literature relating to this Cycas he placed it among the "Species minus notae" with this remark: "Num sit *C. Rumphii* vel *C. circinalis*, vel propria species, hoc ulterius Parisiis investigandum esset. Spadix femineus crenatus in icone Pet. Th. figuratus a formis indicis omnino differt." Nor was De Candolle certain that the species is really a native of Madagascar, although he considered it "in Comores vere spontanea." This seemed to him evident from the communication he had received from Brongniart concerning the Paris material of *C. Thouarsii*, which according to this authority consisted of (1) a female specimen in Petit Thouars's herbarium "cum germinatione vel foliis junioribus" without indication of origin or author's label; (2) a specimen by Commerson, written up "*C. circinalis* L. Samble de Madagascar. Au Réduit, 1769," and leaves with a label by Desfontaines "Madagascar. Commerson"; (3) specimens collected by Boivin‡ in the islands of Anjouan (Johanna) and Mayotte. I have not seen any of these specimens, but would call attention to the following considerations. Petit Thouars speaks distinctly of his Cycas as the "Samble" of Madagascar, (l.c., p. 2) and says that he never saw its seeds being eaten in Madagascar, from which it may be safely inferred that he came across it in that island, although no doubt his observations as stated by Jussieu and L. C. Richard, were made in Mauritius. Commerson, 30 years before Petit Thouars, also knew it as the "Samble de Madagascar," though he, too, found it growing at Réduit in Mauritius. It has since been collected in "Central

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* In Tijdschr. v. Wis. en Nat. Wetens. II. p. 287.
† In Archives Neerlandaises, III. p. 236.
‡ This would have been probably in 1847.

Madagascar" by Baron (No. 2163 in Herb. Kew), and although no particular locality is indicated on this label, Baron, in his paper "The Flora of Madagascar" mentions it as one of the elements of the flora of the littoral belt of his eastern region* while Drake del Castillo, in 'Madagascar au debut du xx^{e} siècle' (1902), p. 117, describes it as covering and ornamenting vast expanses along the east coast. The occurrence of *C. Thouarsii* there is also borne out by a specimen collected by Perrier de la Bathie between Vohémar and the Matitana River (Lat. 14° S.) and communicated recently by Professor H. Jumelle. It was precisely this eastern region, particularly the neighbourhood of Foule Point (Petit Thouars) and Fort Dauphin (Commerson) which Petit Thouars and Commerson visited. Baron's specimen and the occurrence of Betsileo and Hova† names for the Cycas suggest that from here the species extends some distance inland. The figure of a Cycas (named *C. circinalis*) from the banks of the Samberanou River (about Lat. 14° S.) on the north-west coast, given in Pollen et Van Dam 'Recherches sur la Faune de Madagascar' vol. i. pl. 19 (1869) probably also represents Petit Thouars's plant. On the other hand, its occurence in the wild state in Mauritius is more than doubtful. Commerson's specimen came from Réduit, the residence of the Governor, where there is an old garden; it was very probably cultivated there, and we may assume that this was also the case with Petit Thouars's Cycas. Bojer in 'Hortus Mauritianus' quotes (p. 301) "*C. circinalis*, au Jardin du Roi, Pampl. et à la Rivière Noire," and gives as vernacular names Faux Sagoutier and Fahou (Malg.). The latter is evidently the Faho of the Betsileo dialect quoted by Heckel. In any case there is no evidence of Cycas occurring in the spontaneous state in the island. Boivin's discovery of the Cycas in the Comoros was confirmed by Kirk in 1861 (Mohilla) and 1862 (Johanna) and by Hildebrandt in 1875 (Johanna). The latter sent home some stems all of which, however, perished, and several hundred fresh seeds. Of these, so far as they were sown, 19 per cent. germinated—the time between sowing and germination differing very much (5 months in extreme cases); but it does not seem that they ever got beyond the stage of the bursting of the testa and possibly the formation of roots‡. This would be quite in accordance with subsequent experience in France where M. Landry, of Paris, experimented with a large number of seeds received from Humblot, who had brought them from the Comoros in 1885. Some of these seeds germinated almost at once, others after a more or less prolonged delay, while many perished without showing any trace of development. Some of those which germinated, did so normally, but the majority developed roots only. Duchartre§

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* In Journ. Linn. Soc. vol. xxv. p. 268.

† Faho and Voafaho (Betsilea) and Voafako (Hova); see Heckel, Plant. Util. in Ann. Mus. Col. Marseill. 2nde ser. vol. viii. (1910) 328.

‡ See A. Braun in Verh. Bot. Ver. Brandenb. 26. Nov. 1875, p. 15 and Sitz. Ges. Naturf. Freunde, Berl. 17 Oct., 1876, p. 114.

§ Journ. Soc. Nat. Hort. France 3^{e} ser. vol. ix. (1887) 48 and in Bull. Soc. Bot. France xxxv. pp. 243-251.

who examined the latter established the fact that they were all destitute of embryos and that the roots sprang from the fleshy albumen from towards the top of the seed. All these rooting seeds died without giving rise to any aerial organs; whether any of the normal seedlings grew up is not stated. Bruant, a nurseryman of Poitiers, who also received some of Humblot's seeds seems, however, to have been successful; in his catalogue (no. 195) for 1888 he offered for sale young plants having 2 or 3 leaves. He considered the plant a new species and named it *C. comorensis*.

Kirk's discovery of this Cycas on the African mainland in the delta of the Zambesi has already been mentioned, and there can hardly be any doubt that it is really spontaneous there; though as to its occurrence in the Zanzibar region it may be pointed out that Werth in his 'Vegetation der Insel Sansibar' (p. 94) says, "*Cycas circinalis*" is frequently brought from the Comoros to Zanzibar and grown as an ornamental plant in the gardens of the Arabs. On the other hand it may be really indigenous on the coast opposite Zanzibar, as Bley * states that it grows in the forests of Usungula on the Kingani River, 50 miles inland from Dar-es-Salaam, that is on the inner edge of the extensive low level forest area which covers a great portion of Usaramo from the coast to near the meridian of Usungula. No specimens, however, have come to hand from this region. Apart from this area the range of the species may be said to extend over a considerable portion of the east coast of Madagascar, and probably also over parts of the central regions of the island, over the Comoros and the coast of the southern part of the Zambesi delta.

So far the status of this Cycas as a species has not been questioned. In the first place, however, it will be expedient to decide the question of the name which should be given to it. Bruant's name *Cycas comorensis* may be dismissed at once as unnecessary; the decision lies only between *C. Thouarsii* of R. Brown and *C. madagascariensis* of Miquel. The plant is so generally known as *C. Thouarsii* that to replace this name by Miquel's would be most inconvenient. Robert Brown's designation has usually been treated as a *nomen nudum* and De Candolle says explicitly that it was published without description. Were this the case, those who accept the rules of the Vienna Code as binding will have to decide for *C. madagascariensis*. The case, however, appears to the writer to be this. R. Brown recognised that Petit Thouars's plant differs from the Indian plant which Linnaeus named *Cycas circinalis*. But Brown did more than this: he contrasted the two species quite clearly (see Prodr. p. 347). While it is true that Brown did not formally describe *C. Thouarsii*, he referred to Petit Thouars's memoir and implicitly stated the synonymy which technically would have been expressed thus: *C. Thouarsii*; syn. *C. circinalis*, Petit Thouars, non Linn., the synonym with its description and illustration doing duty for a fresh description under the new name. It is impossible to contend that any

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* Bley, Deutsche Pionierarbeit in Ost-Afrika 1891; from quotation in Engler, Pflanzenwelt Ost-Afrikas, p. 172.

doubt exists as to what R. Brown meant by his *Cycas Thouarsii*, and this name may very well be accepted as valid.

That Du Petit Thouars applied the name *C. circinalis* to the plant whose germination and fructification he had studied is not surprising when we consider the very imperfect knowledge of the genus which the botanists of his time possessed and when we take into account the fact that he was in no way concerned with the taxonomic aspect of the subject. When C. L. Richard's paragraph on *C. circinalis*, with its singular confusion of the Indian and the African plants, was actually written we do not know, and, the work having been published posthumously, little stress can be laid on the author's views. But as soon as systematists like Robert Brown and Miquel took the matter up they recognised the discrepancies between Petit Thouars's plant and the true *C. circinalis*. De Candolle, however, with the conflicting evidence of the earlier authors and no actual specimens before him, left the question undecided, but brought in *C. Rumphii* as a possible synonym. Subsequently, in 1876, A. Braun, relying on Hildebrandt's specimens, accepted it as a distinct species, closely allied to *C. Rumphii** and mainly characterised by its large seeds. The same year, unaware of Hildebrandt's collection or of A. Braun's papers, E. Regel in his revision of *Cycadaceae* reduced *C. madagascariensis*† and *C. Rumphii* to *C. circinalis* giving no reason for so doing; this, too, without including Madagascar in the area of his species which is simply described as India orientalis. The same view is also expressed by Thiselton-Dyer in a note in the Challenger Report, Botany, vol. i. iii. (1885) p. 207, where *C. circinalis* is said to be known from "Western Tropical Africa and Madagascar (*Cycas Thouarsii*, R. Br., Prodr. xvi. p. 528), and from Malabar and Ceylon, perhaps also the Nicobars" and "Miquel . . . . records it from the coast districts of Java, Sumatra, Borneo, Timor and the Moluccas." In Eichler's elaboration of the *Cycadaceae* in the Natürliche Pflanzenfamilien, vol. ii., i. p. 21 (1889), *C. Thouarsii* is retained as a distinct species closely allied to *C. circinalis* and *C. Rumphii*. Then again in 1895 it is included in *C. circinalis* by Engler in Pflanzenwelt Ost-Afrikas, C. p. 422; but when a few years later Warburg studied the group more thoroughly, he came to the conclusion that *C. Thouarsii* should be treated as a distinct species‡. A middle course was finally attempted by Engler who has treated it as a subspecies of *C. circinalis*.

In order to show clearly the contrasting characters of *C. Thouarsii*, *C. Rumphii* and *C. circinalis* these may be set out in parallel columns. The macroscopic characters are taken mainly from the material available at Kew and, excepting where extremes are given, represent average features; the figures for the height of the plants are quoted from literature. For the microscopic characters Mr. W. B. Turrill is responsible.

* Sitz. Ges. Naturf. Freunde, Berl. 17 Oct., 1876, p 113.

† The name *C. Thouarsii* is not mentioned by Regel at all, nor is there any reference by him to the paper by Du Petit Thouars or the memoir by C. L. Richard.

‡ Monsunia, vol. i., p. 180, 181.

Macroscopic characters.

	Thouarsii.	Rumphii.	circinalis.
Height of stem	Up to 6 m.	Up to over 6 m. (occasionally to 15 m.; begins to flower when barely 2 m. high)	Up to 5 m. (occasionally 12 m.).
Fronds	Up to over 1 m. long	1–2 m. long	1·5 to 2·5 m. long.
Spines of petiole	1–1·5 cm. apart ...	2–3 cm. apart ...	1–2 cm. apart.
Number of pinnae	Up to 65	50–70	80–100.
Distance of pinnae	1 cm. apart	1·2–1·5 cm. apart ...	
Shape and dimensions of pinnae	Gently curved, linear, 20–30 cm. by 0·8–1·4 cm.	Rather straight, linear, 20–30 cm. by 15–17 mm.	Gently curved, linear 18–24 cm. by 0·9–13 cm.
Midrib of pinna when dry	Grooved above ...	Grooved above ...	Not grooved above.
♂ sporophylls	Acumen short, abruptly recurved	Acumen reflexed or recurved	Acumen long, gradually tapering.
♀ sporophylls	Blade ovate-lanceolate, crenulate	Blade short, oval, sparingly and minutely toothed or serrate, rarely lobed, from a terete narrow claw	Blade long acuminate, serrate with numerous, sharp narrow teeth, from a flat broad claw.
Seed	Ellipsoid-globose, up to over 6 cm. long	Ovoid to subglobose, 5–7·5 cm. by 3·75–4·3 cm.	Ovoid to globose 2·5–5 cm. in diam.

Microscopic characters.

	Thouarsii. Zambesi mouth, Kirk	Rumphii. Singapore, Ridley 4408	circinalis. Bangalore, J. Cameron 497.
Pinna half-way between midrib and margin	Palisade cells forming half the section which is 0·5 mm. in width. There are 3 or 4 layers of accessory transfusion tissue and 2 layers of spongy parenchyma cells. A well developed cuticle is present on the upper epidermis and a less developed one on the lower. The stomata are numerous and occur on the lower surface only.	Palisade cells forming more than half the section which is about 0·5 mm. in width. There are 4 or 5 layers of accessory transfusion tissue and 1 layer of spongy parenchyma cells. The cuticle is very strongly developed above and is distinct below. The numerous stomata are limited to the lower surface	Palisade cells forming half the section which is about 0·25 mm. wide. There are about 2 layers of accessory transfusion tissue and 1 layer of spongy parenchyma cells. The cuticle is not well developed on either side. The stomata are numerous on the lower surface and on the sides of the midrib.
Margins of the pinna	Slightly revolute, with 3 or 4 layers of sclerenchyma and a very strong cuticle	Very slightly revolute, with one layer of sclerenchyma forming a hypodermis and a very strong cuticle	Very slightly revolute, with very little sclerenchyma and a strong cuticle.
Midrib of pinna	With furrows and small median ridges on both sides. A little thick-walled sclerenchyma is present on both sides of the bundle	Concave above and convex below, with a thickened hypodermis and a very inconspicuous thickened sheath round the bundle	Convex above and slightly concave below, with a slightly thickened sheath but no definite sclerenchyma.

No doubt the characters given in the table may have to be amended in details when tested on more ample material than is at present available, but at the same time they make it perfectly clear that the affinity of *C. Thouarsii* lies with *C. Rumphii* rather than with *C. circinalis* which contrasts markedly with both. Whether *C. Thouarsii* and *C. Rumphii* should be treated as subspecies of one species, in which case the name *C. Thouarsii* would have priority over the *C. Rumphii*, depends more or less on whether a wide or narrow conception of the species be taken. But nothing would be gained by merging them in one species whilst the important fact of their inhabiting two areas so widely separated would run the risk of being obscured. For practical purposes they will always have to be treated as distinct entities.

II.—AFRICAN MORINDAS.

J. Hutchinson.

In the Flora of Tropical Africa (vol. iii. pp. 191 2), Hiern describes two species of *Morinda* (*Rubiaceae*), *M. citrifolia*, Linn., and *M. longiflora*, G. Don.

Under "*M. citrifolia*," according to Hiern's conception, I find there are two distinct species represented, neither of which can be said to agree with *M. citrifolia*, Linn., an East Indian, Malayan and Polynesian species. The points in which these two African species, *M. lucida*, Benth., and *M. geminata*, DC., differ from each other and from the true *M. citrifolia* are shown as follows:—

M. citrifolia, *Linn.;* stipules large and foliaceous, mostly persistent; peduncles solitary, shorter or as long as the fruit-body.

M. geminata, *DC.* (=*M. citrifolia*, Hiern, partly, not of Linn.); stipules small and persistent, never foliaceous; peduncles almost invariably paired, becoming thickened and elongated in fruit and much longer than the fruit-body.

M. lucida, *Benth.* (=*M. citrifolia*, Hiern, partly, not of Linn.); stipules large and foliaceous, but soon decidous; peduncles paired or in threes, long and slender, much longer than the fruit-body.

Morinda citrifolia, Linn., is much cultivated in India on account of certain economic properties. From its roots the *A'l* dye of commerce, a fast dull red dye, is obtained (see Watt, Dict. Econ. Prod. India, v. 260–75).

It is very probable that one of the African species, *M. geminata*, may have the same properties as the eastern plant, and from this standpoint would perhaps merit the attention of West African foresters. Both are used in medicine by the inhabitants of their respective countries, chiefly as a tonic and febrifuge (see note under *M. geminata*).

In "*M. longiflora*," of Hiern, there are also two quite distinct species, the true *M. longiflora*, G. Don, and *M. confusa*, Hutchinson. The latter has been described by Mr. Baker as *Gaertnera morindoides* (*Loganiaceae*), but it is undoubtedly a

true *Morinda*. It seems advisable, however, to use a new specific name for this plant in preference to *morindoides*, owing to its incongruity in combination with the generic name *Morinda*.

Kew is much indebted to Mr. C. E. Lane-Poole, Conservator of Forests, Sierra Leone, for abundant material of flowers and fruits, in formalin, with information relating to the three species which occur in that colony. According to Mr. Lane-Poole all these *Morindas*, with the exception of *M. lucida*, which is not known from farther north than the Gold Coast, are distributed throughout the rain-forest areas of Sierra Leone, but have not so far been found in the savannah country.

CLAVIS SPECIERUM AFRICANARUM.

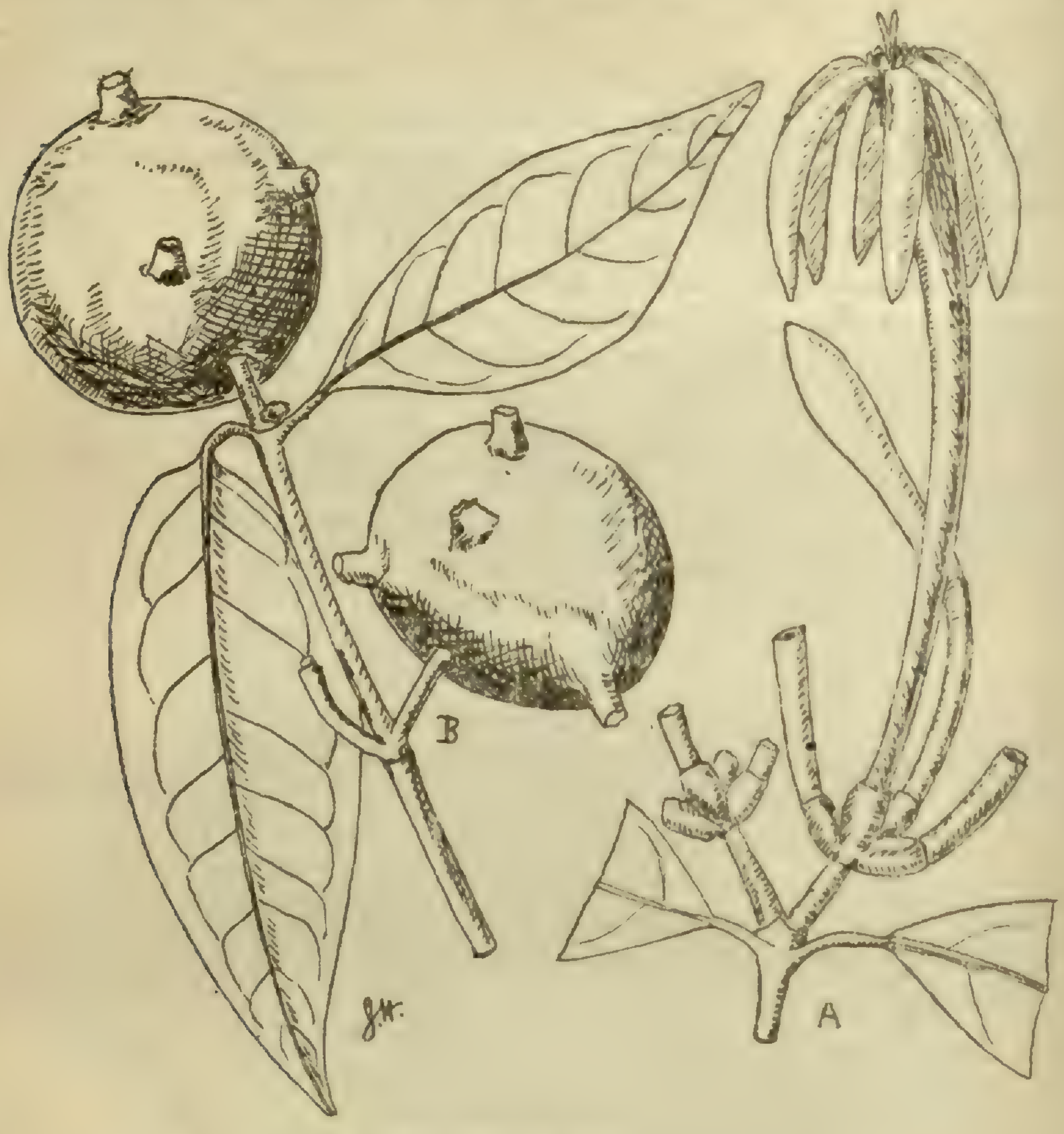
Frutices scandentes; pedunculi terminales vel ramulos laterales breves terminantes, nec oppositifolii; flores 6–7-meri:—
  Pedunculi geminati; corollae tubus elongatus gracilisque, faucibus dense villosus vel pubescens, rarius fere glaber; ovarium glabrum; fructus turgidus, calycibus persistentibus 2–4 cornutus ... ...1. *M. longiflora.*
  Pedunculi solitarii; corollae tubus praecipue alabastro brevis crassusque, faucibus glaber; ovarium plerumque puberulum; fructus calycibus persistentibus crasse pluriumbonatus ... ...2. *M. confusa.*

Arbores vel frutices multe ramosi, nec scandentes; pedunculi oppositifolii et interdum etiam terminales; flores 5-meri:—
  Ramuli graciles, plus minusve teretes; stipulae magnae et foliaceae, mox deciduae; pedunculi elongati gracilesque; alabastra gracilia; fructus 2·5 cm. diametro vel minus ... ...3. *M. lucida.*
  Ramuli robustissimi, quadrangulares; stipulae parvae et persistentes; pedunculi et alabastra robusta; fructus 3–6 cm. diametro ... ...4. *M. geminata.*

M. longiflora, *G. Don*, Gen. Syst. iii. 545; Hiern in Oliv. Fl. Trop. Afr. iii. 192, partim. *Descript. emend.*

Frutex scandens, usque ad 3 cm. altus, floribundus; rami elongati, graciles, leviter costati, ceterum teretes, glabri. *Folia* petiolata, oblongo-elliptica vel obovato-elliptica, basi breviter cuneata, apice subabrupte vel abrupte acuminata, acumine obtuso circiter 1 cm. longo, 6-12 cm. longa, 2-7 cm. lata, coriacea, glabra, interdum utrinque subnitida; nervi laterales utrinsecus 5-6, arcuati, a costa media sub angulo 45°-65° abeuntes, infra prominentes, intra marginem arcuatim anastomosantes; venae infra laxe reticulatae, prominentes; petioli 0·5-1·5 cm. longi, glabri; stipulae brevissimae, mucronatae. *Flores* albi, fragrantes; pedunculi terminales, germinati vel rarius 3-4-nati,

aequales, 0·5-1·5 cm. longi, plerumque graciles, glabri, 3-5-flori. *Receptacula* ima basi inter se adnata, circiter 3 mm. longa,



M. longiflora, G. Don.
A. apex of branchlet showing paired peduncles; B. fruits:—nat. size.

margine leviter cartilagineo-undulata, glabra. *Corolla* longe tubulosa, in alabastro leviter curvata, 4-8 cm. longa; tubus ad apicem parum expansus, medio circiter 2·5 mm. diametro, extra minutissime puberulus, faucibus dense pubescens vel villosus; lobi plerumque 6, lineari-lanceolati, subobtusi, crassi, usque ad 2·5 cm. longi, glabri. *Antherarum apices* vix exserti; loculi 5 mm. longi. *Stylus* brevissime vel vix exsertus, glaber. *Fructus* non lobatus, turgidus, 2-3 cm. diametro, calycibus persistentibus tubulosis 2-4 ornatus.

Distrib.—Sierra Leone to Fernando Po and the Cameroons:—Sierra Leone: Kessewe Reserve, Apr., fls. and fr., *Lane-Poole* 132; near Ninia, Talla Hills, about 2000 ft. alt., Feb., *Scott Elliot* 4901; Mano, *Thomas* 9969; 10000; 10258; 10263; 10315; 10386; without precise locality, *Don*. Gold Coast: Kwahu, 2000 ft. alt., Apr., *Johnson* 667. Nigeria: Eket district, *Talbot* 3255; Oban, *Talbot* 205. Fernando Po: banks of the river, June, *Mann* 411; 2341; *Barter* 2061. Cameroons: Bipinde, *Zenker* 2361; 4636. "West Africa," *Whitfield*.

Vernacular names—*Leverek beni* and *Benti* (*Lane-Poole*).

2. **M. confusa,** *Hutchinson*, nom. nov.

M. longiflora, Hiern in Oliv. Fl. Trop. Afr. iii. 192, partim, et in Cat. Afr. Pl. Welw. 1492; Stapf in Johnston, Liberia, 613; non G. Don.

Gaertnera morindoides, Baker in *Kew Bull.* 1892, 83.

Frutex scandens vel subscandens; rami graciles, subteretes vel sicco parum sulcati, glabri. *Folia* petiolata, elliptica, oblongo-elliptica vel late elliptica, basi brevissime cuneata, apice plerumque breviter et obtuse acuminata, 6-15 cm. longa, 3-8 cm. lata, tenuiter chartacea, utrinque glabra, leviter nitida; nervi laterales utrinsecus circiter 6, arcuati, a costa media sub angulo 45°-60° abeuntes, supra prominuli, infra prominentes, intra marginem anastomosantes; venae infra prominenter reticulatae; petioli 0·5–1·5 cm. longi, glabri; stipulae tubulosae, truncatae, circiter 2 mm. longae, coriaceae, glabrae. *Flores* albi vel flavo-virides; pedunculi terminales, solitarii, circiter 15–flori, 1–2·5

M. confusa, Hutchinson.

A. apex of branchlet showing solitary peduncle; B. fruit:—nat. size.

cm. longi, demum (in fructu) incrassati et indurati. *Receptacula* inter se basi adnata. *Calycis tubus* truncatus, 4 mm. longus, carnosus, plerumque puberulus. *Corolla* breviter tubulosa, in alabastro recta et crassa, usque ad 3 cm. longa; tubus medio circiter 0·5 cm. diametro, extra glaber vel minute puberulus,

intra glaber; lobi 6–7, lineari-lanceolati, subobtusi, circiter 1 cm. longi, 3–4 mm. lati, carnosi, glabri. *Apices antherarum* leviter exsertae; loculi 6 mm. longi. *Stylus* circiter 3 cm. longus, exsertus, bilobus, lobis 6–7 mm. longis. *Fructus* maturus ambitu depresso-globosus, 4 cm. diametro, prominenter et alte pleriumbonatus.

Distrib.—Sierra Leone through the coast forest districts to Angola and in the N.E. Belgian Congo:—Sierra Leone: Balso Farm, Dec., *Scott Elliot* 4186; near Ninia, Talla Hills, about 2000 ft. alt., Feb., *Scott Elliot* 4901; Bagroo River, Apr., *Mann* 810; within a belt of 45–70 miles of "Sierra Leone" [Freetown?], *Garrett* 28; Kambui Reserve, Mar., *Lane-Poole* 193; various localities, *Thomas* 113; 5626; 5686; 5748; 8023; 8470; 8509; 8840; 9766; 10390. Liberia: within 6 miles of Monrovia, *Whyte;* without precise locality, *Farmer* 347. Gold Coast: Aburi, *Johnson* 1069; sea-beach at Bushua, near Dixcove, Apr., *Chipp* 178; Kumassi, *Cummins* 43. French Guinea: Bilima, *Chevalier* 14690. Nigeria: Lagos, *Maloney;* Botanical Station, *Millen* 168; interior of Western Lagos, *Rowland;* Eppah, *Barter* 3272; without precise locality, "Ojuologbo vine," *Imperial Institute specimen* no. 6. Cameroons: Batanga, July, fls., *Bates* 333; without precise locality, *Braun.* Fernando Po: Nov., *Vogel*, 188. Gaboon: Gaboon river, *Mann.* North East Belgian Congo: Niamniamland; on the Jura river, Mar., *Schweinfurth* 3334. Angola: Golungo Alto; near Ponte de Felix Simões, Nov., fl., *Welwitsch* 4757; borders of forests close to the river Delamboa, Jān., fls., and by the Ambaca road at Camilungo, Sept., fr., *Welwitsch* 4758.

Scott Elliot says that this plant is known in Sierra Leone as *Ogidogbo*, and is a well-known native medicine for fever, and recognised as being very efficacious. Mr. Lane-Poole informs us that the Mendi name is *Wawae*, and a decoction of the leaves is used for stomach trouble and is particularly suitable for expelling worms.

3. **M. lucida,** *Benth.* in Hook. Niger Flora, 406 (1849).

M. citrifolia, Hiern in Oliv. Fl. Trop. Afr. iii. 191, partim, non Linn. *M. citrifolia*, var. *lucida*, Hiern in Cat. Afr. Pl. Welw. i. 492.

Distrib.—Gold Coast to Angola and North-East Tropical Africa:—Gold Coast: Axim, white-flowered tree, Nov., *Chipp* 21; without precise locality, *Brass; Evans* 25; Togoland: Marsch, May, *Krause;* near Lome, Warnecke 177; Sokode, Apr., *Kersting* 64; Togo, *Bauman*, 141; Nigeria: Western Province; Lagos, *Moloney;* Ibadan Road, tree 15 ft. high, *Millen* 106; Ikirinu, *Millson;* Abeokuta, small tree with white flowers, *Barter* 3388; *Irring* 70; Central Province; Onitsha, *Barter* 1234; 1753; Eastern Province; Cross River Division, large straight-boled tree, Uwett, *McLeod;* Inkum and Ekom, Jan., *Holland* 240. Eket district, *Mr. and Mrs. P. A. Talbot*, 3233; 3148; Engilea, Mar., *Kitson.* Fernando Po: *Barter* 2039; *Vogel* 77; Cameroons: Cameroon River, tree 80 ft., Jan., *Mann* 717; Bipinde, *Zenker* 2322; 2521; 2656. French Congo: Brazzaville, Dec., *Chevalier* 11200; without precise locality, *Smith* 47. Princes Island: in

forests about Pico Papagais, *Welwitsch* 4756. Angola: Barra do Bengo; banks of the river Bengo, near Santo Antonio, Dec., *Welwitsch* 4755; Golungo Alto; banks of the river Delamboa, May, *Welwitsch* 4754; Malange district, *Gossweiler* 1231; Cazengo district; near the railway line at Senge de Stombe, *Gossweiler* 760. Monbuttuland: between Rapili and Kibali, Apr., *Schweinfurth* 3658. Uganda: Kampala and environs, *Whyte*; on hills near Kampala, Feb., *Scott Elliot* 7295, 7371; Entebbe, *Mahon*; near the Semliki river, 2300 ft., Nov., *Bagshawe* 1297.

M. lucida, Benth.

A. flowering shoot showing the three peduncles opposite the leaf; B. fruit:—nat. size.

Uses.—Used by the natives in dysentery and fever, ascertained by Dr. Beswick to be powerfully astringent (*Barter*, 1234); yellow dye obtained from the tree (*MacLeod*); bitter and astringent, used by the people with good effects in dysentry (*Barter*, 2039); timber used by negroes for building their huts.

Vernacular names—*Eruwo* (*Millson*); *Guigo* (*Welwitsch*, 4756) and *N-golo-mugi* (*Welwitsch*, 4754).

According to Welwitsch this is a beautiful tree, remarkable for the peculiar lustre of its foliage and the abundance of its white fragrant flowers. Gossweiler describes it as a tree 40 ft.

high with a trunk about 1 ft. in diameter, much-branched, the branches somewhat drooping and densely leafy, with pure white, aromatic flowers.

M. lucida may be readily distinguished from *M. geminata* by its usually slender and subterete branchlets, its slender peduncles and much smaller flowers and fruits.

4. **M. geminata,** *DC.* Prodr. iv. 450 (1830).

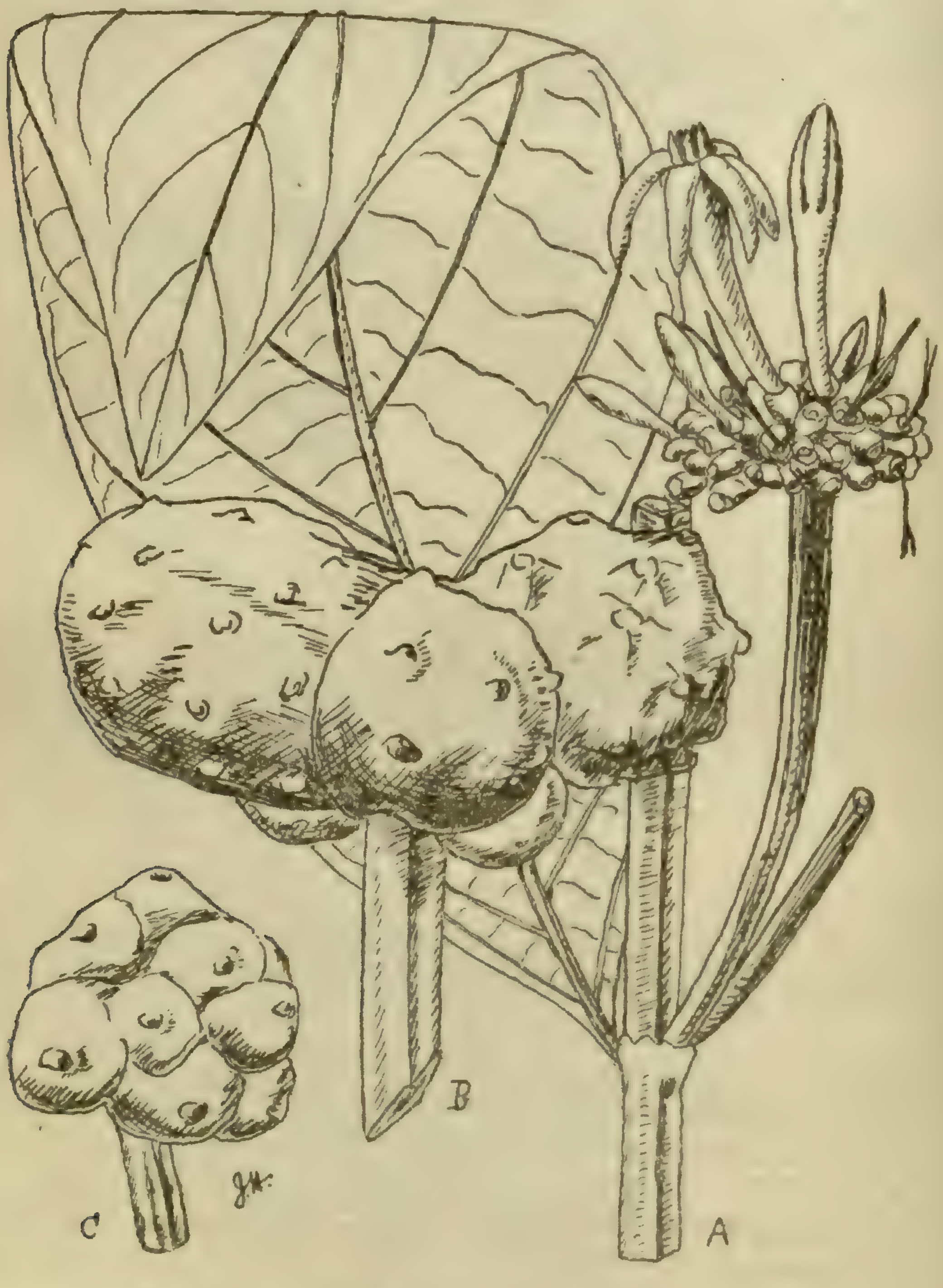
Psychotria chrysorhiza, Schum. et Thonn. Pl. Guin. 111 (1827)?

Morinda macrophylla, Desf. Cat. Hort. Par., ed. 3, 404 (1829)?

M. chrysorhiza, DC. Prodr. iv. 450 (1830)?

M. quadrangularis, G. Don, Gen. Syst. iii. 545 (1834).

M. citrifolia, Hiern in Oliver Fl. Trop. Afr. iii. 191, partim, non Linn.



M. geminata, DC.

A. part of flowering branchlet showing paired peduncles opposite the leaves; B. and C. large and small fruits :—nat. size.

Arbor usque ad 9·5 m. alta, trunco ad 40 cm. diametro; ramuli ultimi robusti, quadrangulares, plerumque circiter 5–8 mm. crassi, glabri, internodiis 4–9 cm. longis. *Folia* late elliptica vel obovato-elliptica, basi breviter cuneata, apice obtuse acuminata, 10–25 cm. longa, 6–15 cm. lata, tenuiter chartacea, glabra vel infra in costa et nervis lateralibus parce pubescentia; costa infra conspicua; nervi laterales utrinsecus 6–8, arcuati, utrinque prominentes; venae laxae, subparallelae, infra conspicuae; petioli 0·5–1 cm. longi, robusti; stipulae interpetiolares, late triangulari-ovatae vel subtransverse oblongae, circiter 5 mm. longae, apicem versus membranaceae. *Pedunculi* plerumque geminati, oppositifolii, robusti, complanato-angulares, 3–8 cm. plerumque 5 cm. longi, 2–4 mm. crassi, glabri. *Capitula* 15–25–flora. *Receptacula* crassa, connata. *Calyces* liberi; tubus cupularis, 2–2·5 mm. longus, margine obscure undulatus,, coriaceus, glaber. *Corollae* in alabastro clavatae, ad 3·5 cm. longae; tubus circiter 2·5 cm. longus, apicem versus leviter expansus; lobi 5, mox reflexi, oblongo-lanceolati, obtusi, carnosi, 1·2–1·4 cm. longi. *Stamina* 5, semiexserta; antherae 5 mm. longae, 1·25 mm. latae. *Stylus* inclusus 1·5 cm. longus, profunde bilobus. *Fructus* magnus, integer vel inaequaliter bilobus vel subtrilobus, depresso-globosus, 3–6 cm. diametro, calycibus persistentibus prominentibus ornatus.

Distrib.—Senegambia to Upper French Guinea:—Senegambia: Cayor district; Caniag village, March, *Döllinger* 52. Sierra Leone: Rotomba Island, March, *Kirk*; Ryaham, Feb., *Lane-Poole* 152; road to Sulimania, March, *Scott Elliott* 5278; Bagroo River, *Mann* 717; Victoria, *Thomas* 9080; Gbanbama, *Thomas* 8899; 8970; 9135; 9345; 9477; 9704; Pujehun, *Thomas* 8562; 8625; Mano, *Thomas* 10324; 10373; "Sierra Leone" *Barter*; *Vogel* 143, 145; *Daniell; Don; Smeathmann & Afzelius*. French Guinea: valley of the Kaba, May, *Chevalier* 13186; Sareya, Feb., *Chevalier* 463.

Vernacular names—*N'Jalajui* (Lane-Poole); *Bungbo* or *Bumbo* (Scott Elliot); *Ojuologboo* (from a specimen, no. 8, communicated by the Imperial Institute).

Mr. Lane-Poole informs us "that this species is known in Sierra Leone as the 'Brimstone Bush'; it is never used for timber but for firewood. From a medical point of view it has a great reputation; the *Temnes* and *Susus* boil the leaves and drink the decoction as a purge; it is also used to bathe in when suffering from malaria; a decoction of the roots is given to weakly babies, and they are washed in it to make them grow strong; the *Mendi* man takes the dried leaves and makes a decoction which he drinks when down with malaria; the roots are chipped up and boiled and the liquid strained and mixed with indigo in the dye pot; the *Creole* makes decoctions of both root and leaves for fevers and these are supposed to be particularly efficacious in cases of yellow fever; the leaves are sold in Freetown markets; the plant is very common everywhere and it flowers throughout the year."

The earliest specific name of this plant is very probably *chrysorhiza* (*Psychotria chrysorhiza*, Schum. et Thonn. l.c.) but as the type of this appears to be no longer in existence it seems

advisable to abandon it. Mr. O. Paulsen very kindly made a search for an authentic specimen in the Botanical Museum at Copenhagen, but without result. Another specific name antidating the one here adopted which might very well have referred to the same plant is *M. macrophylla*, Desf. This species was founded on a plant grown in the Paris Botanic Gardens in 1829, but Prof. Lecomte informs us that no dried specimen has been found in the Paris Herbarium. In regard to the examination of the type of *M. geminata*, DC., (1830), M. C. De Candolle very kindly supplied a portion for comparison, and its identity with *M. quadrangularis*, G. Don (1834), has thus been confirmed.

III.—CONIFEROUS TIMBERS.

The Junipers and their Commercial Importance.

W. Dallimore.

Short descriptions of several kinds of juniper wood were given in *K.B.* 1913, No. 6, pp. 220–222, under the heading "Cedar Woods." In the present article those notes are extended and other species not so well known commercially as cedar are included.

The genus *Juniperus* includes many species of evergreen trees and shrubs widely distributed in the northern hemisphere and occurring south of the Equator in the mountains of Eastern Tropical Africa. They are found throughout Europe, including the British Isles, in Asia Minor, Asia from the Himalaya northwards almost to the limit of shrub life, North America, the West Indies, Northern Africa, East Africa, the Canary Islands and the Azores. The majority are hardy in the British Isles, those from sub-tropical countries usually occurring on the mountains, but a few are too tender for outdoor culture here. They are often of slow growth, and it is doubtful whether any species planted under forest conditions in the British Isles would prove a financial success. Some of the species are dwarf or almost prostrate bushes, whilst others grow into fine trees 70–100 ft. high, and even in the same species considerable variation in habit may occur according to the conditions of climate, altitude and soil. The leaves may be acicular and spreading, or scale-like and pressed close to the branches. The acicular type always obtains in seedlings and in some species prevails throughout life, but in other cases it soon gives place to the scale-like leaves of the adult state, though in several species both kinds of leaves are found on mature plants. The fruits are berry-like, several seeds being enclosed by fleshy resinous scales. In many instances the wood is red or yellow in colour and fragrant. It is sometimes used for building purposes and for cabinets, but its most important use is for the casings of lead pencils, no other kind of wood having been found so suitable for this purpose as the better grades of juniper. When too small or knotty for other uses it forms very serviceable fences. Oil, used for perfumery, etc., is obtained from the

wood by distillation and may also be procured from the leaves and fruits of certain species. Medicinal properties of a diuretic character are possessed by the junipers. The following species are of economic importance:—

J. barbadensis, *Linn.*—Barbados Cedar, Southern Red Cedar.

A species closely related to *J. virginiana* and apparently a southern form of that tree. It is found in the Southern United States and the West Indies (*see K.B.* 1911, p. 377), though now very rare in the Islands. In the Southern United States it often grows in swamps near coastal rivers, and under the best conditions attains a height of 50 ft. with a girth of 6 ft., its average size being 30 ft. The leaves of the adult tree are very like those of *J. virginiana*, but the habit appears to be looser and the branches more pendent. The wood is soft, close-grained, red and fragrant, and it is popular for pencil making when it can be procured in quantity, but during late years the supply has become scarce. From the "Report on the Agricultural Department, St. Lucia," 1914–15, it appears that a small plantation of this species has recently been started at Réunion.

J. bermudiana, *Linn.*—Bermuda Cedar, Bermuda Red Cedar.

This tree is said to dominate the other arborescent vegetation in Bermuda where it grows under a variety of conditions, both in brackish swamps and on limestone hills. Average-sized trees are 40–50 ft. high with a trunk 3–4 ft. in diameter. On adult trees both kinds of leaves are found. The wood is valuable for ship-building and for furniture. Cabinets made from it are said to be highly prized in Bermuda. Some specimens are very prettily marked.

J. californica, *Carr.*—White Cedar, Sweet-berried Cedar, Californian Juniper.

A bush or small tree up to 40 ft. high with a trunk 12 ins. in diameter found wild in California, Arizona, etc. The wood is described as soft, close-grained and light reddish-brown. It is durable and used for fence posts in its native country.

J. Cedrus, *Webb & Berth.*—Canary Island Juniper, Canary Island Cedar, Sabina Tree.

This tree is a native of the Canary Islands where, according to Elwes and Henry, "Trees of Great Britain and Ireland," vi., p. 1414, it ascends the mountains to a height of 7000–9000 ft., sometimes attaining a large size. Mature trees are up to 70–80 ft. high with stout trunks carrying spreading heads of branches with pendent branchlets. The leaves are acicular and the fruits nearly $\frac{1}{2}$ in. in diameter. The wood has been too scarce of late years to be of much commercial value, but it has excellent lasting properties and ranks with the better qualities of juniper wood. Two forms of the species have been mentioned, one more free growing and of looser habit than the other. Conditions of growth have, however, been thought to account to some extent for the difference in habit.

Attention has recently been directed to this species by Dr. G. V. Perez, of Tenerife, who considers it might be planted with advantage under forest conditions for the sake of its

timber. He has sent us the following particulars of young trees growing in his garden 1200 ft. above sea level, and has also sent a quantity of seed for distribution to suitable countries.

"No. 1: a seedling female tree brought from above 'Arafo,' Tenerife, and planted out in 1906 is now 8·61 m. high and 47 cm. in girth. No. 2: A male tree from the same place and of similar age is 6·37 m. high and 37 cm. in girth. No. 3: A cutting struck from No. 1, in the open and afterwards planted out at the end of 1907 or early in 1908 is 6·28 m. high and 25 cm. in girth. No. 4: A female seedling grown from seed obtained in the Island of Palma planted out at the end of 1910 is 5·45 m. high." All the measurements were taken in the summer of 1915. Dr. Perez remarks "*J. Cedrus* is the one (species) that grows the quickest, a fact that may be of great importance considering the imperishable and valuable wood it gives." There does not appear to be any chance of *J. Cedrus* proving a success under forest conditions in the British Isles, for it is generally too tender for our climate even though it may succeed as a decorative tree here and there, but in the West Indies and New Zealand, whence seed has been sent, good results should be obtained. It is interesting to note in comparison that *J. virginiana* in its native country, according to information supplied by Dr. Perez from a reliable American source, increases in height 6–18 in. annually, and that the yearly increment is $\frac{1}{5}$ in. In East Africa trees of *J. procera* planted in 1905 now average $23\frac{1}{2}$ ft. in height with a girth of 19 in. at 4 ft. above the ground.

J. chinensis, *Linn.*—Chinese Juniper.

Elwes and Henry l.c., p. 1430, refer to this tree as attaining a height of 60 ft. in China and Japan, but it occasionally grows 70–80 ft. high according to Sargent, "Forest Flora of Japan," p. 78. It is quite hardy in the British Isles, and is largely grown as a decorative tree or bush. In several places it has been recorded as being between 35–48 ft. high. In a young state it usually forms a dense bush, but old examples develop a distinct trunk with a more or less rounded head. The leaves are usually scale-like in character, but even on the oldest trees shoots occur with acicular leaves. The fruits are about $\frac{1}{3}$ in. in diameter, and they take two years to ripen. Although the wood is durable and useful for many purposes, that from burred trees being prettily marked, it is not obtainable in quantity and is of no importance in the timber market.

J. communis, *Linn.*—Common Juniper, Ground Cedar.

A species widely distributed through Europe, Northern Asia and North America. In the European Alps it ascends to a considerable altitude and has been recorded at 11,900 ft. on Monte Rosa; it is commoner, however, between 6000–8000 ft. It is wild in the British Isles from the Surrey Downs to the Scottish Highlands, and also occurs in Ireland, but in each instance it inhabits certain areas rather than being a general plant. It is specially noticeable on chalk and varies a good deal in habit, for, though usually a spreading bush 3–12 ft. high, it may grow much taller and in some Continental countries attains a

height of 30–40 ft. with sometimes quite erect branches. The leaves are always acicular $\frac{1}{4}$–$\frac{1}{2}$ in. long, green below with a silvery line on the upper surface. The berries are about $\frac{1}{3}$ in. in diameter, almost black when ripe and take 2 years to mature. The wood is too small for building purposes, but is used for fencing with satisfactory results. Elwes and Henry l.c., p. 1408, mention a fence of this timber with posts of oak which surrounds the royal deer park near Copenhagen, which in 1887 had been in existence about 100 years. In some Continental countries the wood is used for milk pails and other domestic articles, and in this country it has some value for walking-sticks. The fruits have been of commercial importance for a long period. They are used for flavouring gin and at one time a considerable quantity was exported from Scotland to Holland for the purpose. Some particulars of the trade were given by Thomas Thomson, M.D., in 1838, in the "Chemistry of Organic Bodies," p. 463. He there says: "The distillers of Schiedam were formerly in the habit of carrying over annually a shipload of juniper berries from Inverness, for the use of their distilleries." The fully grown but unripe berries are considered to be richer in oil than ripe berries. The oil is used for medicinal and for flavouring purposes. In the "Resources of the Southern States of America," by F. P. Porcher, 1869, pp. 187–188, juniper berries of certain species are said to be used with apples, pears and the fruits of *Amelanchier canadensis* in the preparation of a wholesome and refreshing drink, whilst a wholesome drink is also said to be formed by placing 30 lbs. of juniper berries in $38\frac{1}{2}$ gallons of water and allowing fermentation to take place. The berries of the common juniper are used with beechwood in the smoking of Westphalian hams, the peculiar piquant taste of the hams being given by the juniper-berry smoke (Journ. Roy. Soc. Arts., Feb. 23, 1912, p. 416).

A very dwarf form *J. communis* var. *nana*, sometimes considered to be a distinct species, is found in some parts of Ireland.

J. drupacea, *Labil.*—Drupe-fruited Juniper, Syrian Juniper.

This is a very distinct species, native of Asia Minor and Syria, where it often grows 60 ft. high with a considerable girth. Under cultivation it is known as a narrow fastigiate tree easily distinguished amongst other species by its large, acicular leaves which often exceed $\frac{1}{2}$ in. in length and $\frac{1}{8}$ in. in diameter. The fruits are larger than those of any other Juniper for they are sometimes 1 in. in length and $\frac{3}{4}$ in. in diameter. The fleshy outer part is said to be eaten by the inhabitants of regions where the species is common. Although the timber is reputed to be of good quality, the consumption is apparently quite local. In the Kew Museums the wood is poorly represented, there being but one small piece. That is from the Taurian Alps and shows about 220 annual rings in a diameter of 6 in.

J. excelsa, *Bieb.*—Grecian Juniper.

A tree widely distributed from the Balkans through South-East Europe to Asia Minor and Syria. It appears to attain its

maximum height, 70–100 ft., in Asia Minor, where it occasionally forms a trunk 4 ft. in diameter. In the British Isles the largest trees are about 35 ft. high. The majority of the leaves are scale-like, but small shoots with acicular leaves are sometimes found. The timber is reputed to be of good quality and has been recommended for railway sleepers.

J. formosana, *Hayata.*—Prickly Cypress.

A species spread over a considerable area in China and also found in the mountains of Formosa. It was introduced to this country about the middle of last century, but is rare in cultivation and is usually met with under the name of *J. oblonga pendula.* Elwes and Henry l.c. 1415–1417, give some particulars about the tree and its distribution and say that it grows about 40 ft. high in China. It is, however, apparently the same tree to which Wilson refers in "A Naturalist in Western China," i. p. 176, when he says: "At Erb-tao-chiao I photographed a magnificent juniper tree 75 ft. tall, 22 ft. in girth with graceful pendent branches." The timber only appears to be of local use.

J. macrocarpa, *Sibth.*—Large-berried Juniper.

This species is found as a bush or small tree throughout Southern Europe and in some parts of N. Africa. The leaves are acicular, often $\frac{5}{8}$ in. long, and the berries are up to $\frac{1}{2}$ in. in diameter. The fragrant wood appears to be used with that of *J. Oxycedrus* for distillation.

J. macropoda, *Boiss.*—Himalayan Pencil Cedar.

A Himalayan tree widely distributed from Nepal to Afghanistan, often from 40–50 ft. high with a trunk 6–7 ft. in girth, but sometimes much larger. It appears to connect the Eastern *J. chinensis* with the Western *J. excelsa,* being nearest to the former species. Specimens of the wood in Museum No. III. at Kew have reddish heart-wood and yellow sap-wood. Writers on Indian timbers describe the wood as fragrant and moderately hard, and to be used for wall-plates, beams and fuel. A closely allied tree from the same region is *J. religiosa.*

J. mexicana, *Schiede.*—Rock Cedar, Juniper Cedar, Mountain Cedar, Cedar.

This species is reported as forming forests on the limestone hills of Mexico and Texas where it sometimes reaches 95 ft. high. The wood is described as hard, weak, close-grained and brown. It is used for general construction, fencing, sills, telegraph poles, railroad ties and fuel.

J. occidentalis, *Hook.*—Canadian Juniper, Californian Juniper, Western Red Cedar, Yellow Cedar.

Sargent, "Silva of North America," x., describes this tree as sometimes attaining a height of 40–50 ft., with a trunk 3 ft. in diameter, but it is usually much smaller and sometimes a mere bush. It is widely distributed in North-West America from Canada to California, and produces a heavy, close-grained

and fragrant wood, of good lasting quality, which is comparable to the rougher samples of *J. virginiana* and is used for fencing as it lasts well in contact with the soil.

J. Oxycedrus, *Linn.*—Sharp Cedar, Brown-berried Juniper.

This species is common throughout the Mediterranean region from sea level up to 5000–6000 ft., usually as a shrub but sometimes as a small tree. In Italy it occupies considerable areas on sand dunes. The leaves are acicular and resemble those of *J. Cedrus*. The principal use of the wood is for distillation, the oil extracted being known as "oil of cade." Factories for the distillation of the oil are established in the Maritime Alps. The wood is cut into sections which, from their appearance, are called "cades gros" or "cades maigres," the latter are used as fuel and the former placed in the still for the extraction of the oil. The oil is given off as a thick dark liquid, the density and darkness being determined by the amount of fire heat used in the distilling process. Oil of cade is used in medicine for skin diseases. Other kinds of juniper wood are reputed to be used as substitutes. An account of the preparation of this oil is given in the Pharmaceutical Journal, October 13, 1906, p. 413.

J. pachyphlaea, *Torr.*—Oak-barked Cedar, Thick-barked Cedar, Mountain Cedar, Chequer-barked Juniper.

A species differing from all others by reason of its thick, scaly bark which is responsible for two of the common names. Under favourable conditions it grows 50–60 ft. high and may be 12–15 ft. in girth. Leaves of both kinds are developed by mature trees. It is found wild in the dry regions of Texas, New Mexico and Arizona. The wood is soft, light red and close-grained. Samples at Kew are straight-grained and bear a resemblance to the wood of *J. virginiana* for which it could probably be substituted.

J. phoenicea, *Linn.*—Phoenician Juniper.

This is an important tree in the Mediterranean region for it is found in South Europe, North Africa, Cyprus and the adjoining mainland, the Canary Islands and Madeira, its timber being used for building purposes and for firewood. It varies in height from little more than a shrub to a tree of 40 ft. The leaves are small and scale-like and the fruits about $\frac{1}{3}$ in. in diameter. In 1913 Sir W. T. Thiselton-Dyer pointed out that the 'Cedar of Lebanon' of the Bible was a juniper and not *Cedrus Libani*, as stated in *K.B.*, 1913, p. 218. Sir J. D. Hooker in his article in "The Natural History Review," on "The Cedars of Lebanon, Taurus, Algeria and India" (January, 1862), states—"The word cedar as used in the Bible, applies to other trees and only certainly to the *Cedrus Libani*, when coupled with some distinctive epithet. . . . . It is in my opinion an open question whether the *C. Libani* is one of those which supplied most of the timber employed in building Solomon's temple. The cypress (also called cedar by the ancients), the *Pinus halepensis* and the tall fragrant *Juniperus* of the Lebanon with its fine red heart-wood, would have been

far more prized on every account." *J. phoenicea* or *J. drupacea*, or both, were probably referred to in this note.

J. procera, *Hochst.*—East African Juniper or Cedar.

Attention has been directed to the timber of this tree during the last few years as a likely substitute for the wood of *J. virginiana* for pencil-making. It is found wild in the mountains of East Africa. The wood has a fine, straight, and almost even grain, a beautiful dark red colour, an even texture, a fragrant cedar-like odour, and is brittle, non-resinous, of light weight and nearly as soft as red cedar.

J. recurva, *Buch.-Ham.*

A tree of pendent habit with acicular leaves, native of the Eastern Himalaya. It grows up to about 40 ft. high, and Gamble, "A Manual of Indian Timbers," p. 698, says that the wood is quite equal to the best pencil cedar but is only used for burning as incense in the Buddhist temples. *J. squamata* from the Western Himalaya, China and Formosa is a closely allied species with very similar wood.

J. rigida, *Sieb. & Zucc.*

A shrub or small tree native of Japan, where, under the most satisfactory conditions, it grows about 30 ft. high. Its leaves are all acicular, slender and spiny, the fruits being globular and $\frac{1}{3}$ in. in diameter. The wood has good lasting properties, and though small, is put to many local uses.

J. Sabina, *Linn.*—Savin.

A species varying in habit from a prostrate shrub to a bush 12–15 ft. high. It is distributed through Central and Southern Europe, the Caucasus, North Persia and North America, and produces both acicular and scale-like leaves. The wood is of little value except for walking-sticks and firewood, but the fresh and dried shoots and leaves contain an oil which is extracted by distillation. Savin oil possesses medicinal properties and the best qualities are said to be obtained from fresh leaves. "The Perfumery and Essential Oil Record," May, 1914, p. 131, cautions readers that the so-called "oil of savin" passed into commerce from the South of France continues to be distilled from various species of *Juniperus*, including *J. phoenicea*, and possibly *J. thurifera*, and that there is a considerable difference between the oils. The only oil that should be accepted as true "oil of savin" being that of *J. Sabina*.

J. scopulorum, *Sarg.*—Red Cedar, Rocky Mountain Red Cedar.

This species forms a small tree 30–40 ft. high with a trunk 2–3 ft. in diameter. It is a native of the Rocky Mountains from Alberta to Western Texas and Westwards to British Columbia and Washington, nowhere very common. The wood is said to be useful for fencing, posts, etc., and to be very like that of *J. virginiana* but less useful.

J. thurifera, *Linn.*—Spanish Juniper, Incense Juniper.

A tree 20–40 ft. high with a trunk 2–4 ft. in diameter. Leaves of both kinds are produced and the fruits are about $\frac{1}{3}$ in.

in diameter. It is distributed through Spain, Portugal, Algeria and Morocco, etc. The wood does not appear to be used other than locally, although it is of good appearance and possesses good lasting qualities.

J. virginiana, *Linn.*—Cedar, Pencil Cedar, Red Cedar, Virginian Cedar.

This species is very widely distributed in North America, and it is the most satisfactory of the large-growing junipers in the British Isles, although it is not of very rapid growth. It is a very valuable species from a commercial standpoint for its wood is used more often than that of any other kind for the casings of lead pencils. Its distribution area ranges from about latitude 45° in Canada to the Gulf States, and from the Atlantic to the mountains that border the Pacific States. It varies from a bush to a tree 120 ft. high with a diameter of 3 ft. (Forest Planting Leaflet, Circular 73, United States Department of Agriculture). As much of the wood is knotty, and only straight wood can be used for pencils, there is a good deal of waste. Knotty wood unsuitable for pencil-making is, however, very useful for fences, railway sleepers, etc. The shavings and dust from pencil factories is distilled for the fragrant oil contained in the wood, the oil thus obtained being used for scenting soap and for other kinds of perfumery. A use has also been found for the shavings after distillation, for they make an excellent substitute for cocoanut fibre as a plunging material for horticultural purposes. The shavings being small are easily manipulated, and equal in preserving warmth and moisture to the fibre previously used which is now difficult to procure owing to its being largely employed for linoleum and other purposes. Moreover, the shavings are of advantage since fungi do not grow upon them.

J. Wallichiana, *Hook. f.*—Black Juniper.

According to Sir D. Brandis, "Indian Trees," p. 695, this is a variable species in the Himalaya reaching an altitude of 15,000 ft., sometimes being found as a small bush and at other times as a tree up to 60 ft. high. The wood appears to be used locally for building purposes.

IV.—MISCELLANEOUS NOTES.

Mr. R. O. Williams, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Curator of the Royal Botanic Gardens, Trinidad.

Research in Jodrell Laboratory in 1915:—

Mr. L. A. Boodle examined the anatomy of several species of plants in relation to their affinities.

Dr. W. Gardiner studied some details in the structure of the sieve-tubes of *Angiopteris.*

Miss E. M. Jesson examined some peculiar structures in the glumes of certain Grasses.

Miss I. Massee made observations on several Fungi connected with diseases of plants.

Miss F. M. Scott made an examination of the anatomy of a hybrid *Cheiranthus*, and began some other anatomical investigations.

Mr. H. Takeda studied some new species of Freshwater Algae and *Flagellata*.

Mr. W. B. Turrill examined the anatomical structure of the leaves of certain Cycads and Grasses.

Mr. W. C. Worsdell studied a number of teratological specimens in relation to their morphological nature, and carried out investigations on the anatomy of the *Cucurbitaceae* and other Dicotyledons.

Pathology.—The routine work of the Pathological Department continues to be very heavy. During 1915 nearly 600 inquiries were dealt with, 316 of which were received through the Board of Agriculture and Fisheries. The work of answering these inquiries has during recent years been greatly simplified by the large number of the Board's leaflets now available. On the other hand many queries entail prolonged microscopic examination or book work, whilst others to be answered accurately and fully would demand original research. Routine work, therefore, seriously interferes with the larger pathological problems claiming investigation.

Considerable attention has been paid during the year to diseases of potato, wheat, and fruit trees, and energies have been devoted as far as possible both in routine work and research to those questions connected with important economic crops.

Additions to Gardens, 1915.—Exchanges were made with the Botanic Gardens of Cambridge, Oxford, Edinburgh, Glasgow, Liverpool and Glasnevin, and with some of the European gardens upon which Kew is largely dependent for seeds of those annual herbaceous plants which fail to produce seeds at Kew. Other donations to the Gardens include the following:—

From Botanic Gardens and other institutions:—

Kirstenbosch, Cape Colony—Stems of Cycads, various seeds.
Singapore—Seeds of Palms; Filmy ferns.
Uganda—Seeds of tree Lobelia.
Trinity College, Dublin—*Amorphophallus Kerrii* and *A. corrugatus*.
Loanda, Angola—Seeds of Palms, etc.
Washington, Department of Agriculture—Seeds *Kokia Rockii*.
Gold Coast—Collection of Yam tubers.
John Innes Institute, Merton—Hybrid Primulas, etc.
Sierra Leone—Collection of Yam tubers.
Washington, Nat. Museum, U.S.A.—Collection of seeds from S. America.
Greenwich Park—*Meconopsis* sp., Primulas, Erigerons, etc.
Uganda—Seeds, *Baikaea insignis*, *Encephalartos* sp.; Wardian case of plants.

Sydney, N.S.W.—Collection of seeds.
New Zealand Government—Collection of varieties of *Phormium tenax*.
Penang—Filmy Ferns and Orchids.
Pietermaritzburg—Orchids, Lycopodiums and bulbs.
Dunedin—Seeds of Celmisias.
Trinidad—Wardian case of plants.
Mauritius—Seeds *Coffea macrocarpa*.
British Honduras—Seeds of *Achras*.
Abyssinia—H.M. Minister—Seeds of three varieties of *Eragrostis abyssinica* (Teff.).

Donations from other sources include the following:—

Mr. L. de Rothschild, Gunnersbury House—*Musa rhodochlamys*.
Mr. H. N. Ridley, Singapore—Seeds of new Malayan plants.
Mrs. Leschallas, Windlesham—Stove plants and Orchids.
Dr. L. Cockayne, Wellington, N.Z.—Filmy ferns.
Messrs. Bees, Liverpool—Seeds from Bhutan and China.
Baron de Soutellinho, Oporto—*Ochna* sp. and *Camellia Thea* and *C. Sasanqua*.
Mr. F. D. Godman, Horsham—Seeds from West Australia.
Sir E. G. Loder, Bt., Leonardslee—*Rhododendron Loderi* and other plants.
Col. S. R. Clarke, Cuckfield—*Dicksonia arborescens* and *Diplazium nigro-paleacum*.
Miss E. M. Saunders—Collection of seeds from Murree.
Miss Willmott, Great Warley—*Clematis aphylla*.
Mr. H. J. Elwes, Colesborne—*Eria ornata*, *Anoectochilus lanceolatus*, Arisaemas.
Mr. E. Scanes, Chingford—Various Cacti.
Mr. J. Burtt Davy, Johannesburg—Seeds *Protea* spp. and *Clematis Stanleyi*.
Mrs. King-Farlow, Teddington Hall—Large specimen plant of *Asplenium nidus*.
Mr. W. R. Dykes, Godalming—Irises.
Mr. G. F. Berthoud, West Australia—Seeds of Compositae.
Sir A. F. Hort, Bt., Harrow—Irises.
Mr. E. Frosio, Uruguay—Seeds of *Pouteria suavis*.
Mr. A. A. Goytisolo, Cuba—Seeds of Palms.
Mr. C. J. Brooks, Sumatra—*Amorphophallus Titanum*.
Mr. R. B. White, Gairlochhead—Cypripediums and Odontoglossums.
Mr. C. H. Lankester, Costa Rica—Orchids.
Hon. Charles Rothschild, Oundle—Irises.
Mr. R. H. Beamish, Ashbourne—Herbaceous plants, *Anemone Fanninii*.
Mr. F. Stoker, Acton—Collection of Orchids.
Captain W. Kemp, Arundel—*Disa grandiflora*.
Mr. R. L. Praeger, Dublin—Crassulas, Sedums, etc.
Mr. M. Eley, Homelands—*Polypodium Dryopteris* var. *plumosum*.
Mr. A. L. de Lautreppe, Putney—Collection of seeds and spores.

Mr. W. F. Lloyd, Siam—*Eulophia* sp.
Mr. G. Elisha, Canonbury Park—Mesembryanthemums.
Dr. G. V. Perez, Tenerife—Seeds of *Juniperus*, *Echium*, etc.
Mrs. Lipscomb, Swanley—Orchids.
Hon. Vicary Gibbs, Aldenham—Various hardy plants.
Mr. M. T. Dawe, Girardot, Colombia—Seeds.

Among the purchases made was a portion of the collection of Orchids formed by the late Right Hon. Joseph Chamberlain, Highbury, Birmingham.

Surplus plants, chiefly hardy, were distributed as usual chiefly among public and teaching institutions.

There was the usual distribution of seeds ripened at Kew among botanic gardens and regular contributors of seeds, etc., to Kew. The total number of packets thus distributed was 1955 hardy herbaceous and 1075 hardy trees and shrubs.

Among the plants and seeds of interest distributed during the year were the following:—Teff (*Eragrostis abyssinica*); Tree Lobelia from Uganda; *Phormium tenax* vars.; Queensland Nut (*Macadamia ternifolia*); *Pouteria suavis; Berberis napaulensis* (true); *Juniperus Cedrus*, from Tenerife.

Arboretum.—The chief work during the early winter season has been the taking down of old trees, especially elms, which could no longer be considered absolutely safe. Among them were two of the "Seven Sister" elms. The removal previously of two other of these elms was recorded in the *Bulletin*, 1914, p. 33, and but one of the original seven now remains. Although several severe storms passed over Kew in November and December, the only loss of any note was the uprooting of one of the fine beeches growing a little north-west of the Azalea Garden. On this area which, in contrast to the greater part of the Gardens, has a deep loamy soil, the best beeches in Kew are now growing.

The removal of the numerous new trees and shrubs from the nurseries to their allotted sites in the grounds has been proceeded with. The greater part of the new introductions of Mr. E. H. Wilson from China (which have made the greatest showing in our nurseries during the past decade) have now been dealt with.

Additions to Tree and Shrub collections.—The disappearance of the firm of Messrs. James Veitch and Sons, of Chelsea, from the horticultural community has meant to Kew the loss of a very prolific source of new trees and shrubs, as well as of other plants. For many years their nursery at Combe Wood was visited regularly by members of the staff who, it may safely be said, never came back empty-handed. The war has practically closed the Continent to traffic of this kind, so that new additions to the collections in 1915 have been much below the average of the last few years. A consignment was received from the Arnold Arboretum early in the year containing, amongst other things, new hickories, oaks and poplars. From the same establishment came a plant of *Sargentodoxa cuneata*, which constitutes a new genus of Rehder and Wilson belonging to the *Lardizabalaceae*. It is a deciduous climber and is described as having pendulous

racemes of yellow flowers. Professor Sargent also sent some seeds collected by Mr. Wilson during his recent travels in Japan. Amongst them was a very welcome packet of seeds of *Rhododendron dilatatum*, a beautiful deciduous species which, hitherto, has been extremely rare in this country. They germinated very freely. Numerous seeds collected by Mr. Forrest in China were received, and from Messrs. Bees some seeds collected by Mr. Cooper in Bhutan. Mr. J. C. Williams made an interesting contribution in a white-flowered variety of *Erica australis*, collected by his son, the late Lieut. Robert Williams, in the south of Spain. This, so far as we know, is new to cultivation and to science. Mr. Gerald W. Loder gave Kew a plant of the very rare *Acanthopanax setchuenense*. Of this species there was, a few years ago, a bush in the Coombe Wood nursery raised from Wilson's seed which at that time appeared to be the only one in the country, but which went to the United States. A valuable collection of shrubs was received from the Edinburgh Botanic Garden that had been noted during an official visit by the Assistant Curator last May. An interesting addition to the Arboretum collection was a plant of *Stuartia serrata*, 5 or 6 feet high, given by Sir Edmund G. Loder, of Leonardslee. The Hon. Vicary Gibbs sent a number of rare species from his great collection at Aldenham. The establishment is also much indebted to the late Canon Ellacombe and to Mr. F. R. S. Balfour for valued contributions.

The following new trees and shrubs have flowered during 1915: Alnus lanata, A. sitchensis, A. Spathii, Amelanchier pumila, Berberis sanguinea, Betula Medwediewi, Celastrus flagellaris, Clematis Fargesii, S. Pavoliniana, Cotoneaster salicifolia var. floccosa, and var. rugosa, Enkianthus himalaicus (Chinese form), Escallonia Balfourii (pterocladon and rubra), Euonymus sanguineus, Fraxinus Paxiana, Photinia subumbellata, Prunus Conradinae, P. Dielsiana var. laxa, P. polytricha, P. thibetica, Pyrus (Sorbus) Kocheana, P. (Sorbus) setschwanensis, Rhododendron discolor, R. erubescens, Rosa Davidii and var. elongata, R. Gentiliana, R. Helenae, R. longicuspis, R. lucens, R. Rubus, R. Sweginzowi, and Syringa affinis.

Museums.—Owing doubtless to abnormal circumstances there have been rather fewer donations than usual to the Museums during the past year. Those of special interest have been recorded from time to time in the *Bulletin*.

A large number of miscellaneous products have been received for determination, and much information has been supplied chiefly upon medicinal plants, oil-producing seeds and timbers.

The re-labelling of the permanent collections has gone on steadily. Owing to depletion of staff it has only been possible for the Timber Museum and the North Gallery to be open to the public, though visitors to the Gardens desiring access to the closed buildings for purposes of study have on all occasions been granted facilities for so doing. During the year 349 persons visited the collections for special study.

A collection of duplicate herbarium specimens, fruits and seeds of home-grown trees and shrubs was loaned to the Whitechapel Art Gallery for the Nature Study and Art Exhibition held during the spring.

Two cases have been placed in one of the rooms of Museum No. IV. for the display of a number of fruit models and of the Veitch collection of Coniferous fruits.

A successor to the late Mrs. Badderly was appointed as Caretaker of the North Gallery.

Additions to the Herbarium during 1915.—During the year about 20,000 specimens were received as donations or exchanges, and about 3000 acquired by purchase, while 400 were received on loan. The principal collections are enumerated below:—

EUROPE.—*Presented*: Britain, by Mr. C. E. Salmon; Switzerland, Matterhorn (E. Whymper), by Dr. W. Botting Hemsley; Italy, by Mr. C. C. Lacaita.

Purchased: H. Dahlstedt, Taraxaca Scandinavica Exsiccata, fasc. 3; Fiori and Béguinot, Flora Italica Exsiccata, Cent. xxi.-xxii.

ORIENT.—*Presented*: Kurdistan (Major Cowie, R.E.), by Mr. R. S. Hole.

ATLANTIC ISLANDS.—*Presented*: Tenerife, by Dr. G. V. Perez.

CHINA AND JAPAN.—*Presented*: China (F. N. Meyer), by the United States Department of Agriculture; (G. Forrest), by the Royal Botanic Garden, Edinburgh; Kansuh, by Mr. H. French Ridley; North River Expedition, by Mr. W. J. Tutcher.

JAPAN.—*Purchased*: H. Takeda.

INDIA.—*Presented*: Bengal and Burma, by Mr. J. H. Lace; Murree, by Miss Elsie M. Saunders; Madras, by the Madras Government Herbarium, through Mr. J. S. Gamble; Madras, by Sir A. G. and Lady Bourne; Malay Peninsula, by Messrs. H. N. Ridley, I. H. Burkill and F. T. Brooks.

Purchased: Dr. W. J. Treutler, Sikkim.

MALAYA.—*Presented*: Siam, by Dr. A. F. G. Kerr, Phra Vanpruk and Mrs. D. J. Collins; Philippine Islands, by Mr. E. D. Merrill.

AUSTRALIA.—*Presented*: New South Wales, by Mr. J. H. Maiden; Western Australia, by Dr. F. Stoward, and (Dr. Alexander Morrison) by the Royal Botanic Garden, Edinburgh, and (C. B. Carter) by Mr. F. Du Cane Godman; Fungi (W. N. Cheesman) by Miss E. M. Wakefield.

NEW ZEALAND.—*Presented*: Fungi (W. N. Cheesman) by Miss E. M. Wakefield.

TROPICAL AFRICA.—*Presented*: Sierra Leone, by Mr. N. W. Thomas; Sierra Leone and Lagos, by Dr. J. M. Dalziel; Northern Provinces, Nigeria, by Mr. E. W. Foster; Southern Provinces, Nigeria (C. O. Farquharson), by Mr. W. H. Johnson and Mr. M. D. W. Jeffreys; Somaliland, by Dr. R. E. Drake-Brockman; British East Africa, by Mr. W. J. Dowson; Uganda, by Messrs. T. D. Maitland, W. Small and R. A. Dümmer.

Purchased: R. A. Dümmer, British East Africa and Uganda.

South Africa.—*Presented*: From various localities, by the Bolus Herbarium and Mr. W. C. Worsdell; Basutoland (Mrs. A. Dieterlen), by the South African Museum; Natal, by Dr. J. Medley Wood; Percy Sladen Expedition Compositae, by Professor H. H. W. Pearson.

Purchased: Miss Alice Pegler, Transkei Fungi.

North America.—*Presented*: Greenland Algae (E. Whymper and Rob. Brown), by Mr. H. N. Dixon; Wisconsin (E. J. Palmer), by the Arnold Arboretum; Bermudan and Floridan mosses, by Mrs. E. G. Britton; Bermudan Algae, by Mr. F. S. Collins.

South America.—*Presented*: Colombia, near Bogota, by Mrs. J. A. Tracey.

General.—*Presented*: Roses, by Mr. J. G. Baker.

Some plants collected by Mr. E. Whymper in 1862 on the South side of the Matterhorn, between 11,500 and 13,000 ft., have been presented by Dr. W. Botting Hemsley. A collection made by Major Cowie, R.E., during the Turco-Persian Frontier Delimitation Expedition, 1914, has been received through Mr. R. S. Hole. Critical species, wild or cultivated in Tenerife, have been presented by Dr. G. V. Perez. The Royal Botanic Garden, Edinburgh, has contributed Chinese specimens collected by Mr. G. Forrest and Western Australian ones from the herbarium of the late Dr. Alexander Morrison. Mr. W. J. Tutcher has presented a set of the specimens he collected in 1914 during the North River Expedition. Mr. J. H. Lace has continued to give specimens collected by him in Burma and Bengal. The collections made in Penang and Selangor by Messrs. H. N. Ridley and C. Boden Kloss have been named at Kew by the former, who has presented them. The large Indian herbarium formed by Sir Alfred and Lady Bourne, between 1896 and 1914, has been presented by them; it consists mainly of Madras plants, but also contains some collected in Simla in 1902. The Sikkim herbarium of the late Dr. W. J. Treutler has been acquired by purchase. Fresh instalments of Siamese plants have been received from Dr. A. F. G. Kerr, Phra Vanpruk and Mrs. D. J. Collins. Mr. E. D. Merrill has contributed a valuable collection of about 2500 Philippine plants. The Australian collection has been enriched by consignments from Dr. F. Stoward, the Government Botanist for Western Australia. Additional Sierra Leone plants have been sent by Mr. N. W. Thomas, and collections from Uganda by Messrs. T. D. Maitland, R. A. Dümmer and W. Small. The Percy Sladen Expedition Compositae (determined at Kew by Mr. J. Hutchinson) have been presented by Professor H. H. W. Pearson. Mrs. A. Dieterlen's Basutoland plants have been presented by the South African Museum. Various South African plants have been received through the Bolus Herbarium and Mr. W. C. Worsdell. Greenland Algae collected by Messrs. E. Whymper and Robert Brown have been presented by Mr. H. N. Dixon. The specimens used as types in the preparation of Miss Willmott's book, *The Genus Rosa*, have been presented by Mr. J. G. Baker.

Presentations to the Library during 1915.—The issues for the year of the periodical and serial publications, now nearly forty, received in exchange for *Hooker's Icones Plantarum*, have been presented by the Bentham Trustees. Owing to the War the number has not been so large as usual. The Trustees have also presented a copy of the Paris edition, dated 1849, of the *Semanario de la Nueva Granada*, issued under the direction of F. J. de Caldas; a volume containing an account of the late Mr. Edouard André's travels in Tropical South America, under the title of *L'Amérique équinoxiale*, a series of articles collected from *Le Tour du Monde*, vols. xxxiv.–xlv., 1877–83, and a copy with coloured plates of Triana's *Nouvelles études sur les Quinquinas*, apparently rather scarce in this condition.

The weekly issues of the *Comptes Rendus* of the Academy of Sciences, Paris, have been presented by Lady Hooker, and those of the American journal *Science* by Miss Alice Eastwood, Curator of the Herbarium of the Californian Academy of Sciences.

Another volume of Mr. William Foster's work, *The English Factories in India*, dealing with the period 1651–1654, has been received from the Secretary of State for India.

Sir Frank Crisp, Bart., has contributed a scarce little volume, unfortunately imperfect, of which the title, since added in manuscript, is: *Erbario che in 32 tavole contiene la figura de 128 piante con la dichiarazione delle virtù e proprietà di ciascuna.* It is attributed to Pietro de Nobili, and its date is probably about 1636.

The fifth volume of the *Catalogue of Books . . . in the British Museum (Natural History)* has been presented by the Trustees. This work supplies a most valuable bibliography of natural history, and its usefulness at Kew may be estimated by the frequency with which it is consulted. Another volume, which will include the additions to the library received during the printing of the five now published, is contemplated and its appearance, it is hoped, will not be long delayed.

Professor M. C. Potter has presented a set of the first eleven volumes of the *Journal of the Board of Agriculture*, and Sir David Prain nineteen volumes of the *Gardeners' Chronicle*. Both these sets have been deposited in the new Pathological Laboratory.

The publications of the Botanical Museum of the University of Zurich, distributed during the year, have been sent to the library by Professor Hans Schinz. These include *Die Flora des Val Onsernone*, by J. Baer; *Vegetationsstudien im Bormiesischen*, by E. Furrer; *Beiträge zur Pflanzengeographie des Kantons Schauffhausen*, by E. Kelhofer; and *Flora des Traverstales und der Chasseronkette*, by C. Wirth. Professor Schinz has also sent the first part of the volume, edited by him and A. Guillaumin, containing the botany of the work on New Caledonia, by F. Sarasin and J. Roux, and vol. 50 (centenary volume) of the *Neue Denkschriften der Schweizerischen Naturforschenden Gesellschaft*.

The numerous and valuable publications of the Department of Agriculture in the Dutch East Indies, sent to Kew by the Direc-

tor, include *Malayan Fern Allies*, by C. R. W. K. van Alderwerelt van Rosenburgh, and *Catalogus Herbarii Plantarum in Horto Bogoriensi cultarum*, by I. Boldingh.

Two further parts of *Nova Guinea: Résultats de l'Expédition scientifique néerlandaise à la Nouvelle Guinée en* 1912 *et* 1913, containing Laubmoose, by M. Fleischer, and Ericaceae, Orchidaceae, etc., by J. J. Smith, have been received from the Maatschappij ter Bevordering van het Natuurkundig Onderzoek der Nederlandsche Koloniën.

The Journal and Proceedings of the Asiatic Society of Bengal, which, up to the time of his death in December, 1911, was presented by Sir J. D. Hooker, is now being received from Major A. T. Gage, of the Royal Botanic Garden, Calcutta.

The two handsome volumes containing Mr. T. F. Cheeseman's *Illustrations of the New Zealand Flora* have been contributed by the Minister of Internal Affairs, New Zealand, through the kind offices of the author. The title-pages are dated 1914, but there appears to have been some delay in distributing the work, for the Kew copy did not arrive till December, 1915.

Mr. and Mrs. Clement Reid's investigations on the Pliocene Floras of the Dutch-Prussian Border have resulted in the publication of a quarto volume which forms No. 6 of the *Mededeelingen van de Rijksopsporing van Delfstoffen*, a copy of which has been received from the Director of the Rijks Herbarium, Leiden. It includes 20 plates of photographs of fruits, seeds and other plant-remains, the identifications of which are of the greatest interest to workers among existing plants as well as to palæobotanists, and of especial value in tracing the origin and distribution of floras.

The Director of the Faculty of Medicine of Buenos Aires has presented a copy of the first volume of a work entitled *Archives inédites de Aimé Bonpland*. This contains unpublished letters, reproduced in facsimile, of Alexander von Humboldt. The fifth volume of the *Acta Horti Bergiani* has been received from the Director of the Garden, Dr. R. E. Fries, and the fourth volume of Dr. Hayata's *Icones Plantarum Formosanarum*, from the Director of the Bureau of Productive Industries, Formosa.

Professor Silvanus P. Thompson has given to Kew the copy of Sir J. E. Smith's *Compendium of the English Flora*, which was formerly owned and used by his grandfather, Mr. John Tatham, who noted in it the localities of the plants found by him in the Settle District. Mr. Tatham's British Herbarium is now at Kew, having been presented by Professor Thompson in 1913.

The establishment is indebted to the following, among many others, for accessions to the library:—Mr. I. H. Burkill, for *Notes on experiments on the different kinds of Timber in ordinary use in the Straits Settlements*, by H. Newton, a scarce tract; Mr. A. D. Cotton, for several publications on Algae; Mr. W. Dallimore, for a copy of *The Practical Fruit Gardener*, by S. Switzer, ed. 2; Mr. J. Ramsbottom, for the *Systematic arrangement of Australian Fungi*, by D. McAlpine; Mr. R. V. Sherring, for a complete set (6 volumes) of the *Proceedings of the Bournemouth Natural Science Society;* the Secretary of Agriculture,

Sydney, for the *Forest Flora of New South Wales*, by J. H. Maiden, part 55; the Director of the Rothamsted Experiment Station, for various reports of the Station, *Inorganic Plant Poisons and Stimulants*, by W. E. Brenchley, and *Soil Conditions and Plant Growth*, by E. J. Russell; Director of the Botanic Garden, Utrecht, for *Indisch Natuuronderzoek*, by M. J. Sirks; the Director-in-Chief of the New York Botanical Garden, for the continuation of the *North American Flora;* the Under-Secretary for Public Lands, Queensland, for the *Report of the Prickly-Pear Travelling Commission*, by T. Harvey Johnston and H. Tryon; the Agricultural Adviser to the Government of India, for the publications of the Agricultural Research Institute, Pusa; the Agricultural Society of Madeira, for *Flora do Archipelago da Madeira*, by C. A. de Menezes; and to the Secretary of Agriculture, Washington, for liberal contributions of the ever-useful publications of the United States Department of Agriculture.

Presentations of books and pamphlets by their authors include:—*Orchidaceae: Illustrations and studies of the family*, by Oakes Ames, fasc. 5; *Araldica Nicotianae*, by G. E. Anastasia; *Les Palmiers de la Côte d'Azur*, by B. Chabaud; *The Flora of the Nilgiri and Pulney Hill-tops*, by P. F. Fyson; *The Mutation Factor in Evolution*, by R. R. Gates; *The Cherries of New York*, by U. P. Hedrick; *Studies on the Vegetation of Cyprus*, by J. Holmboe; *Opmerkingen over eene Buitenzorgsche Kritiek op mijne Exkursionsflora von Java*, by S. H. Koorders; *Bitter Pit Investigation*, by D. McAlpine, 2nd, 3rd and 4th reports; *A Critical Revision of the genus Eucalyptus*, by J. H. Maiden, parts 22 and 23; *Catalogue of Japanese Plants . . . in the Herbarium of the Natural History Department, Tokyo Imperial Museum*, by T. Makino and K. Nemoto; *Shokubutsu-Mei-i*, part 1, *Chinese names of Plants*. by J. Matsumura; *Recherches . . . sur les Radis cultivés*, by Y. T. Riolle; and *Check-list of the Bryophyta of South Africa*, by T. R. Sim.

Manuscript additions include a Catalogue, written by Lady Bourne, of the Plants collected by Sir Alfred and Lady Bourne chiefly in Madras, from 1896 to 1914. From Mr. N. W. Thomas have been received seven foolscap folio volumes containing the list of the native names of the Plants of Sierra Leone; and to Mr. Du Cane Godman the Library owes a slip catalogue of additions to the botanical bibliography of Central America, compiled by Dr. W. Botting Hemsley, and intended for the supplementary volume of the *Biologia Centrali-Americana*, but so far unpublished. Mrs. C. B. Dickson has presented her coloured drawings of 480 British Fungi and 49 Flowering Plants, arranged in two large volumes. Botanical names, localities and dates are supplied with the drawings which are of considerable merit.

The complete list of additions made to the Library during the year will appear in Appendix II. to the *Kew Bulletin*, 1916.

VI.—Species and Principal Varieties of Musa. Price 1*s.* 6*d.* By post, 1*s.* 9*d.* (Selected Papers from the *Kew Bulletin.*)

VII.—Rubber. Price 1*s.* 6*d.* By post, 1*s.* 10*d.* (Selected Papers from the *Kew Bulletin.*)

VIII.—New Genera and Species of Cyperaceae. Price 1*s.* 6*d.* By post: United Kingdom, 1*s.* 9*d.*; Foreign and Colonial, 1*s.* 10*d.*

[Illustrations of Cyperaceae. 144 Plates. Price 12*s.* 6*d.* net. By post, 13*s.* 3*d.* Williams & Norgate, 14, Henrietta Street, Covent Garden, W.C.]

IX.—The Useful Plants of Nigeria. Part I. Price 2*s.* By post: United Kingdom, 2*s.* 3*d.*; Foreign and Colonial, 2*s.* 4*d.* Part II. Price 2*s.* 6*d.* By post: United Kingdom, 2*s.* 9*d.*; Foreign and Colonial, 2*s.* 10*d.* Part III. Price 3*s.* 6*d.* By post, 3*s.* 10½*d.*

X.—Flora of Kwangtung and Hongkong. Price 4*s.* 6*d.* By post: United Kingdom, 4*s.* 10*d.*; Foreign and Colonial, 5*s.* 0½*d.*

Sold also by H.M. Stationery Office (Scottish Branch), 23, Forth Street, Edinburgh, and E. Ponsonby, Ltd., 116, Grafton Street, Dublin.

OFFICIAL GUIDES ON SALE.

By Gale & Polden, Ltd., at the Royal Botanic Gardens, Kew.

Popular Official Guide to the Royal Botanic Gardens, Kew, with map. 1912. Cloth Boards, 6*d.* By post, 7½*d.*

Official Guide to the Museums of Economic Botany. No. 1: Dicotyledons and Gymnosperms. 1907. 10*d.* By post, 1*s.*

Official Guide to the Museums of Economic Botany. No. 2: Monocotyledons and Cryptogams. 1894. 4*d.* By post, 5*d.*

Official Guide to the Museums of Economic Botany. No. 3: Timbers. [Under revision.]

Official Guide to the North Gallery. 6th Ed., revised and augmented. 1914. 6*d.* By post, 7½*d.*

Catalogue of Portraits of Botanists exhibited in the Museums of the Royal Botanic Gardens. 1906. 5*d.* By post, 6*d.*

Hand-list of Trees and Shrubs grown in Arboretum [excluding Coniferae]. 2nd Ed. 1902. 1*s.* 3*d.* By post, 1*s.* 7*d.*

Hand-list of Coniferae grown in the Royal Gardens. 2nd Ed. 1903. 3*d.* By post, 4½*d.*

Hand-list of Trees and Shrubs (2nd Ed.) and Hand-list of Coniferae (2nd Ed.) in one volume. Cloth Boards, 1*s.* 7*d.* By post, 1*s.* 11*d.*

Hand-list of Ferns and Fern Allies, cultivated in the Royal Gardens. 2nd Ed. 1906. 5*d.* By post, 6½*d.*

Hand-list of Herbaceous Plants cultivated in the Royal Gardens, 2nd. Ed. 1902. 1*s.* 9*d.* By post, 2*s.* 2*d.* Cloth Boards, 2*s.* 6*d.* By post, 2*s.* 11*d.*

Hand-list of Orchids cultivated in the Royal Gardens. 2nd Ed. 1904. 1*s.* By post, 1*s.* 2½*d.*

Hand-list of Tender Monocotyledons cultivated in the Royal Gardens. 2nd Ed. 1915. Cloth Boards, 1*s.* 6*d.* By post, 1*s.* 8*d.*

Hand-list of Tender Dicotyledons cultivated in the Royal Gardens. 1899. 2*s.* 6*d.* By post, 2*s.* 10*d.*

WORKS IN PREPARATION AT THE ROYAL BOTANIC GARDENS, KEW.

The Botanical Magazine.—An illustrated monthly magazine consisting of figures of plants, raised and flowered mainly in the Royal Botanic Gardens, Kew; each number contains five plates with descriptive letterpress. [Third Series, Vols. I. to LX. (1845 to 1904) 42*s.* each, net.] Fourth Series (Vols. I. to X., 1905–1915, 42*s.* each, net). Edited by the Director. Price 3*s.* 6*d.* coloured, 2*s.* 6*d.* plain. L. Reeve & Co., Ltd., 6, Henrietta Street, Covent Garden, London, W.C.

Hooker's Icones Plantarum.—This work contains figures with descriptions of new or rare plants, of which specimens are contained in the Herbarium of the Royal Botanic Gardens, Kew. Edited by the Director, for the Bentham Trustees. Each volume contains 100 plates, issued in four parts. Price 4*s.* per part. A limited number of sets of the third series (consisting of ten volumes and 1,000 plates) are still for sale; price 5*l.* Messrs. Dulau & Co., 37, Soho Square, London, W.

Flora Capensis.—A systematic description of the plants of the Cape Colony, Caffraria, and Port Natal. Edited by Sir W. T. Thiselton-Dyer, K.C.M.G., C.I.E., F.R.S. Vols. I. to III., 20*s.* each. Vol. IV., Section 1, 52*s.*; Section 2, 24*s.* Vol. V., Section 1, 34*s.*; Section 2, Parts 1 and 2, 8*s.* each; Section 3, 17*s.* Vol. VI., 24*s.* Vol. VII., 33*s.* L. Reeve & Co., Ltd., 6, Henrietta Street, Covent Garden, London, W.C.

Flora of Tropical Africa.—Edited by Sir W. T. Thiselton-Dyer, K.C.M.G., C.I.E., F.R.S. Vols. I. to III., 20*s.* each. Vol. IV., Section 1, 30*s.*, Section 2, 27*s.*; Vol. V., 25*s.* 6*d.*; Vol. VI., Section 1 48*s.*; Vol. VII., 27*s.* 6*d.*; Vol. VIII., 25*s.* 6*d.*; net. L. Reeve & Co., Ltd., 6, Henrietta Street, Covent Garden, London, W.C.

Flora of British India.—By Sir Joseph Hooker, G.C.S.I., F.R.S., &c. Consisting of English descriptions of all the flowering plants of British India, together with their synonyms, distribution, &c. Complete in seven volumes, 12*l.* L. Reeve & Co., Ltd., 6, Henrietta Street, Covent Garden, London, W.C.

Index Kewensis Plantarum Phanerogamarum.—Nomina et synonyma omniumge nerum et specierum a Linnaeo usque ad annum 1885 complectens. By Sir Joseph Hooker, F.R.S., &c., and Mr. B. Daydon Jackson, Sec. L.S., &c. Complete in four parts. Oxford: price 10*l.* 10*s.*; with the first supplement (1886–1895), 12*l.* 13*s.* Second supplement (1896–1900), 1*l.* 8*s.* Third supplement (1901–1905), 1*l.* 8*s.* Fourth supplement (1906–10), 1*l.* 16*s.* At the Clarendon Press.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

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The Annual Volumes for 1887 to 1892 are out of print and cannot now be supplied.

A Complete Index to the twenty volumes of the *Kew Bulletin*, 1887–1906, is contained in Appendix V., 1906, price 7*d*.

Additional Series.

I.—Economic Resources of the West Indies. Price 1*s*. 6*d*. By post: United Kingdom, 1*s* 10*d*.; Foreign and Colonial, 1*s*. 10*d*.

II.—Vegetable Fibres. [Reprint.] Price 3*s*. 6*d*. By post, 3*s*. 11*d*. (Selected papers from the *Kew Bulletin*.)

III.—Catalogue of the Library of the Royal Gardens, Kew. Price 7*s*. 6*d*. By post: United Kingdom, 8*s*. 3*d*. (To be obtained only from the Royal Botanic Gardens.)

IV.—List of published Names of Plants introduced to Cultivation: 1876 to 1896. Price 4*s*. By post: United Kingdom, 4*s*. 5*d*.; Foreign and Colonial, 4*s*. 6*d*.

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Continued on p. 3 of cover.]

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

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No. 2] [1916

V.—DECADES KEWENSES

PLANTARUM NOVARUM IN HERBARIO HORTII REGII CONSERVATARUM.

DECAS LXXXVII.

861. **Aethionema pseudarmenum,** *Stapf et Sprague* [Cruciferae-Lepidineae]; ab *A. armeno*, Boiss., quocum adhuc confusum est, ala siliculae lacerato-dentata distinguitur; ab. *A. Diastrophi*, Bunge, statura minore, siliculis minoribus brevius dentatis differt.

Caules 8–16 cm. longi, ut rhachis pedicellique acute papillosi. *Folia* lineari-oblonga, obtusiuscula, 0·7–1·4 cm. longa, 1·5–2·5 mm. lata, carnosula, marginibus reflexis. *Racemi* 1–1·5 cm. longi; pedicelli 2–2·5 mm. longi. *Sepala* late hyalino-marginata, 2·5–2·75 mm. longa, 1–1·4 mm. lata. *Petala* in toto 4 mm. longa, oblongo-spathulata, subtruncata vel leviter retusa, trinervia; unguis erectus, 2·5 mm. longus; lamina patula, 1·7 mm. longa, rosea, inter nervos albida, nervo medio bifurcato, ramis cum nervis lateralibus connexis, rete venularum intramarginali uniseriali. *Stamina breviora* arcuato-ascendentia, filamentis 1·5 mm. longis; stamina longiora erecta, filamentis 2·4 mm. longis basi valde unilateraliter ampliatis 0·7 mm. latis; antherae ovato-oblongae, 0·7 mm. longae, vix apiculatae. *Ovarium* oblongo-ellipticum, 1 mm. longum, 0·7 mm. latum, margine jam sub anthesi conspicue dentatum; stylus cum stigmate capitato 0·8 mm. longus. *Silicula* nondum matura supra ob alas inflexas conspicue concava, basi retusa, apice emarginata sinu triangulari quam stylo sesquilongiore.

ASIA MINOR. Anatolia, *Wiedemann*; Armenia Minor, Delidagh, *Bornmüller* 3262; Paphlagonia, Vilayet of Kastambuli, Giaurdagh, *Sintenis* 4186.

Described from a living plant cultivated at Kew under the name *A. armenum*.

862. **Arenaria roseiflora,** *Sprague* [Caryophyllaceae]; affinis *A. melandryoidi*, Edgew., et *A. napuligerae*, Franch.; ab illa caulibus magis ramosis, foliis angustioribus, floribus brevius pedicellatis, ab hac stylis duobus, ab ambabus floribus majoribus differt.

(4297.) Wt. 153—601. 1,125. 3/16. J. T. & S. G. 14.

Radices carnosi, ramosi. *Caudex* brevis, carnosus, caules plures emittens; caules decumbentes, ramosi, versus apicem ascendentes, intense rubri, pilis brevissimis deflexis instructi, parte horizontali ramulos simplices steriles vel fertiles emittente; internodia 1-3 cm. longa. *Folia* basi 1–1·5 mm. connata, primum ascendentia, demum patentia vel patula, lineari-lanceolata, obtusiuscula, in basin sensim angustata, 1-1·7 cm. longa, 1·5-2·5 mm. lata, usque medium vel altius ciliata, apice leviter recurva, supra concava, glabra, nervo medio impresso, subtus convexa nervo medio prominente piloso saepius rubro. *Flores* solitarii, terminales vel in cymis bifloris. *Pedunculi* 2-2·5 cm. longi, ut superiores caulium partes et pilis brevissimis acutis deflexis et aliis longioribus glanduloso-capitatis patulis muniti. *Sepala* concava, plus minusve naviformia, ambitu oblongo-lanceolata, obtusa, 0·8–1 cm. longa, explanata 2·5-3·5 mm. lata, exteriora glanduloso-ciliata, interiora latissime hyalino-marginata, omnia nervo medio extra glanduloso-piloso. *Petala* erecto-ascendentia, pallide rosea, oblanceolata, apice 1–1·5 mm. bifida, sinu angustissimo, lobulis irregulariter 2–3-dentatis, 1·6–1·7 cm. longa, 4·5 mm. lata, flabellatim polynervia. *Stamina* 10; filamenta subulata, glabra, purpurascentia, antesepala 8 mm. longa, basi bulboso-incrassata, antepetala 7 mm. longa; antherae 1·75 mm. longae. *Ovarium* oblongum, compressum, 3·5 mm. longum, 2 mm. latum; styli 2, 4–4·5 mm. longi; ovula circiter 20, utrinsecus biseriata.

China. *Forrest* 13,225. Described from a plant cultivated in the Royal Botanic Gardens, Kew.

863. **Ochna Beddomei,** *Gamble* [Ochnaceae]; *O. squarrosae,* Linn., affinis, foliis majoribus oblongis vel obovato-oblongis apice obtusis et pedicellis longioribus differt.

Arbor parva, ramulis crassis griseo-brunneis. *Folia* chartacea, oblonga vel obovato-oblonga, apice obtusa vel interdum retusa, basi attenuata, glabra, siccitate rufescentia, margine crenata, 14-20 cm. longa, 3-7 cm. lata; costa crassa; nervi primarii plus minus conspicui irregulares e secundariis vix distinguendi, omnes reticulatione conspicua e lineis parallelis formata connexi; petiolus brevissimus vix 2-3 mm. longus. *Flores* in racemis vel paniculis 1 cm. longis e ramulis anni praecedentis; pedicelli graciles, 4–5 cm. longi; calycis lobi oblongi, erecti; petala lutea, calyce paullo longiora; filamenta brevia, circiter 3 mm. longa; antherae 5 mm. longae; styli ad apicem connati. *Fructus* e drupis 3–5 disco incrassato insidentibus; drupae ovoideae, 5–6 mm. longae, laeves, nitidae.

India. Northern Circars in Ganjam and Godavari, *Gamble*; Deccan in Kurnool, Cuddapah and North Arcot, *Beddome*; Mysore, *Cameron*.

864. **Rosa lucens,** *Rolfe* [Rosaceae]; a *R. longicuspi*, Batal., ramulis novellis non villosis, foliis breviter cuspidatis, floribus laxe corymbosis, et fructibus minoribus differt.

Frutex subscandens, ramosus, 2–3 metralis. *Ramuli* glabri, brunneo-purpurei, aculeati, aculeis latis recurvis brunneo-pur-

pureis vel rubris 0·5–1 cm. longis. *Folia* 8–10 cm. longa, 5–9-foliolata; rhachis glabra, subtus parce aculeata; foliola brevissime petiolulata, ovato-elliptica vel elliptico-oblonga, acuta vel breviter cuspidata, crebre crenulato-serrata, glabra, lucida, atro-viridia, 1·5–7 cm. longa, 1·3–5 cm. lata, stipulae adnatae, anguste oblongae, 0·8–2 cm. longae, glanduloso-serratae, apice divergentes, subulatae, acuminatae. *Flores* laxe corymbosi, 3–4 cm. diametro; pedunculi circiter 2·5–3 cm. longi, crebre glandulosi. *Receptaculum* ovoideum, 5 mm. longum. *Calycis* lobi lanceolati, caudato-foliacei, glandulosi, extra puberuli, 1·3–2 cm. longi, 2 exteriores folioloso-pinnatifidi. *Petala* obovato-elliptica, 2–2·3 cm. longa, alba. *Filamenta* glabra, 5–7 mm. longa; antheris aureis. *Stylus* columnaris, 5–6 mm. exsertus. *Fructus* globosus, parce scabridus, 1–1·5 cm. diametro.

China. *Wilson* 1234.

An introduction of Mr. E. H. Wilson, which has flowered at Kew and in several other collections during the last few seasons, and which bears a considerable resemblance to *R. sempervirens*, L., and the Himalayan *R. longicuspis*, Batalin, and like them has sub-evergreen foliage. The purple branches, dark green shining leaves, and corymbs of numerous white flowers render it very attractive. The fruits ripen very late, no change of colour being visible at the beginning of November.

865. **Anotis longiflora,** *Hutchinson* [Rubiaceae-Hedyotideae]; affinis *A. ingratae*, Wall., sed calycis segmentis et corollae tubo multo longioribus facile distinguenda.

Caules robusti, prope medium circiter 3 mm. crassi, flexuosi, superne strigoso-pubescentes, demum plerumque glabri vel glabrescentes, internodiis 2–5 cm. longis. *Folia* oblongo-lanceolata vel lanceolata, acute acuminata, ad basin abrupte et cuneate attenuata, 3–8 cm. longa, 1–3 cm. lata, tenuiter chartacea vel membranacea, supra adpresse setuloso-pubescentia infra in nervis et costa patule pilosa; nervi laterales utrinsecus 7–9, arcuati, utrinque subconspicui; petioli 0·5–1·5 cm. longi, pilosi; stipulae multisectae, basi extra pilosae, segmentis lineari-filiformibus 5–6 mm. longis pilosis. *Flores* terminales, in corymbum congestum dispositi. *Receptaculum* parce pilosum. *Calycis* lobi 4, subaequales, subulato-lanceolati, acuti, 3·5–4 mm. longi, setoso-ciliati. *Corollae* tubus cylindricus, 1·2 cm. longus, 1·25 mm. diametro, superne extra parce pilosus, intus pubescens; lobi 4, oblongo-ovati, obtusi, 3 mm. longi, 1·25–1·75 mm. lati, extra setoso-pilosi. *Antherae* ad faucem insertae, inclusae, 2 mm. longae. *Stylus* exsertus, glaber, breviter bilobus. *Fructus* maturus non visus.

India. Madras: Pulney Hills, Herb. *Wight*; edge of evergreen forest, 2100 m., Sept., *Fischer* 2914 [Herb. Calcutta].

866. **Vernonia Ramaswamii,** *Hutchinson* [Compositae-Vernonieae]; affinis *V. anceps*, C. B. Clarke, sed foliis angustioribus superne obscure serrulatis differt.

Frutex trichotome ramosus; rami ascendentes, dense breviter hirsuti, superne foliati, internodiis subapproximatis. *Folia*

lineari-oblanceolata, apice subacuta, ad basin in petiolum sensim attenuata, 2–6 cm. longa, 5–8 mm. lata, subchartacea, superne obscure serrulata, inferne integra, supra glabra, infra glandulosa demum nigro-maculata, primum puberula sed demum glabrescentia; nervi laterales utrinsecus 7–8, supra leviter impressi, infra valde prominentes, intra marginem conjuncti; petioli ad 7 mm. longi, hirsuti. *Capitula* subterminalia, solitaria vel geminata, longe-pedunculata, circiter 1 cm. diametro; pedunculi satis robusti, 4·5–5·5 cm. longi, dense vel subdense tomentelli, infra apicem circiter 1 mm. crassi. *Involucrum* late hemisphericum, 6–8 mm. altum; bracteae circiter 4-seriatae, glabrae, exteriores subulato-lanceolatae, acutae, interiores oblongo-lanceolatae, subacutae, margine submembranaceae. *Receptaculum* convexum, in fructu circiter 4 mm. diametro, conspicue reticulatum. *Corolla* extra puberula. *Achaenia* conspicue 5-costatae, inter costas parce pubescentia. *Pappus* duplex, albus, setis exterioribus brevissimis, interioribus gracilibus 5 mm. longis brevissime barbellatis.

India. Madras: Tinnevelly district; on the banks of streams at Naterikal, 1300 m., Feb., *Ramaswami* in Herb. Calcutta no. 38,581; Agastiyarmalai, May, *Barber* 2885.

This species shows a very obvious affinity with *V. anceps*, C. B. Clarke, which is apparently endemic to Ceylon; in the latter the leaves are broader and more coarsely toothed.

867. **Calocephalus globosus,** *Scott et Hutchinson* [Compositae-Inuloideae]; species distinctissima, a *C. lacteo*, Less., foliis filiformibus omnino alternis, inflorescentiis globosis flavis differt.

Herba annua; caules 1–2 vel plures, simplices, usque ad 17 cm. longi, gracillimi, lanati. *Folia* alterna, suberecta, filiformia, subacuta, 4 cm. longa, superne sensim minora, subteretia, plus minusve lanata. *Capitula* cylindrica, 5 mm. longa, in glomerulum densum globosum circiter 1·3 cm. diametro arcte aggregata, 4–flora, flavo-straminea. *Involucri* bracteae circiter 4-seriatae, exteriores ovato-lanceolatae, 1–2 mm. longae, interiores lineari-lanceolatae, acutae, 4–4·5 mm. longae, scariosae, glabrae. *Corollae* tubus 3 mm. longus, inferne cylindricus, superne paulum ampliatus, glaber; lobi 5, triangulares, 1·5 mm. longi. *Achaenia* dense gelatinoso-papillosa. *Pappi* setae circiter 20, albae, 1·75 mm. longae, dense plumosae.

Western Australia. Kauring, on the York–Greenhills line, *Stoward* 505.

868. **Bassia butyraceoides,** *Scott* [Sapotaceae]; a *B. butyracea*, Roxb., foliis acute acuminatis, nervis tertiariis parallelis confertioribusque, corollae lobis ad 16, staminibus 70–80, filamentis setoso-pilosis, ovario glabro differt.

Arbor cortice plus minusve rugoso, ramulis dense rufo-tomentosis. *Folia* oblongo-obovata, apice acute acuminata, acumine ad 1 cm. longo, basi attenuata, 15–25 cm. longa, 6–11 cm. lata, margine undulata, membranacea, supra nitida, utrinque glabra; costa media supra leviter impressa, infra prominens; nervi

laterales utrinsecus 16–19, a costa sub angulo 45° abeuntes, sed prope marginem adscendentes, supra distincti, infra elevati; nervi tertiarii plus minusve paralleli, undulati, utrinque elevati; petiolus 2–4 cm. longus, 2 mm. crassus, supra canaliculatus. *Flores* magni, alabastro ovati, 12 vel plures intra folia terminalia conferti, pendentes, pedicellati pedicello 1·5–2 cm. longo dense rufo-tomentoso costato. *Calycis* lobi 5, imbricati, late ovati, apice obtusi vel subacuti, 1·8–2 cm. longi, 1·8 cm. lati, indumento dense rufo-tomentoso induti. *Corollae* tubus brevissimus, basi extra pilis longis tenuibus dense indutus; laciniae ad 16, acutae, contortae, fere 2 cm. longae, plus minusve tenues, haud carnosae, ochraceae, reflexae (fide *M. S. Ramaswami*). *Stamina* 70–80, longe lanceolata, 8 mm. longa, leviter verrucosa; filamenta brevia, 1 mm. longa, pilis setosis longis induta. *Ovarium* glabrum, in disco magno 6–7 mm. longo positum; stylus glaber, longus, exsertus; ovula minuta, plana, orbicularia.

India. Assam: N.E. Frontier; Nizamghat, 160 m., *Upendranath Kanjilal* 3137 [Herb. Calcutta].

869. **Aristolochia Lawrenceae,** *N. E. Br. Bot. Mag.* t. 8650. [Aristolochiaceae]; species ab omnibus sectionis *Unilabiatarum* floribus magnis limbo oblique oblongo vel elongato ovato-oblongo distinctissima.

Caulis volubilis, glaber. *Folia* petiolata, stipulata, glabra; petiolus 5–6 cm. longus; lamina 8–11 cm. longa, 9–12 cm. lata, late et profunde cordata, apice subacuta vel obtuse rotundata, lobis basalibus late rotundatis, supra viridis, subtus glauco-virens. *Stipulae* 1–2 cm. longae, 1·5–2 cm. latae, sessiles, orbiculatae, basi cordatae, glabrae. *Pedunculi* axillares, solitarii, ovariis inclusis 12–14 cm. longi, ebracteati, glabri. *Perianthium* magnum, unilabiatum, luteo-album, pulchre brunneo-purpureo-venosum, glabrum; tubus supra basin inflatam subito refractus, parte inflata 5 cm. longa 3 cm. diametro intus prope apicem pubescente, parte superiore aequilonga subinfundibuliformi; limbus sessilis, 10–12 cm. longus, basi 7–8 cm. latus, erectus, oblique oblongus vel elongato-ovato-oblongus, apice obtusissime rotundatus. *Columna* subsessilis, leviter obconica, apice 6-loba; lobi 3 mm. longi, lanceolati, erecti, apice incurvi, obtusi. *Antherae* 6, lineares, apice basin loborum columnae attingentes. *Capsula* 10–11 cm. longa, 3·5–4 cm. diametro, oblonga, costato-hexagona, basi dehiscens. *Semina* 1·5 cm. longa, 1·3 cm. lata, plana, cuneato-obovata, subpapyracea, supra levia, subtus area centrali minute verruculosa.

Argentine. Exact locality unknown. Described from a plant sent to *Lady Lawrence.*

No other species of the *Unilabiatae* group bears any very close resemblance to this handsome species which is distinguished by the very oblique oblong tail-less limb of its large flowers.

870. **Sarcococca Wallichii,** *Stapf* [Buxaceae]; affinis *S. salignae*, Muell. Arg., et cum ea confusa, sed foliis latioribus, floribus ♂ majoribus, pedicellis fructigeris longioribus laxe bracteatis, seminibus majoribus facie carinatis distincta.

Frutex vel *arbuscula* glaberrima. *Folia* lanceolata, caudato-acuminata, 8–12 cm. longa, 2–3·25 cm. lata, laete viridia, subcoriacea, costa tenui supra inter sulcas prominula, 3–5-plinervia, nervis lateralibus suprabasales utrinque 5–7; petiolus 0·8–1·2 (rarius ad 2) cm. longus. *Flores* albidi in glomerulos axillares collecti, superiores ♂, inferiores ♀, vel ☿ in axillis 2-nati; pedicelli ♂ brevissimi, ♀ florentes nutantes, 3–5 mm. longi, fructiferi 6–9 mm. longi, bracteis demum valde dissitis; bracteae ovatae, acuminatae, ciliolatae, ad 1·5 (raro 2) mm. longae. *Perianthii* ♂ sepala 4, late ovata vel elliptica, obtusa, ad 4·5 mm. longa, minutissime ciliolata. *Stamina* 4, filamentis 5 mm. longis, antheris fere 2 mm. longis. *Perianthii* ♀ sepala ovata, acuta, ad 2 mm. longa, minutissime ciliata; stigmata 3, vix 2 mm. longa, revoluta. *Fructus* ovoidei, vel ovoideo-globosi, atro-purpurei, 0·8–1·2 cm. longi. *Semina* atra vel atro-fusca, nitida, obovoidea, 8 mm. longa, facie carinata—*Sarcococca saligna* et *S. coriacea*, Muell. Arg. in DC. Prodr. vol. xvi. p. 11, excl. syn. *S. prunifolia*, Hook. f., Fl. Br. Ind. vol. 267 (pro parte).

Nepal. Without precise locality, *Wallich* (1821) in Herb. Hook.; north slopes of Phalut and valley of Tambur river, *J. D. Hooker*.

VI.—DIAGNOSES AFRICANAE: LXV.

1561. **Monodora Stocksii**, *Sprague* [Anonaceae]; affinis *M. Veithii*, Engl. et Diels, a qua foliis sub anthesi majoribus apice rotundatis vel apiculatis nec acutis, petalis exterioribus apice subrotundatis margine leviter undulato nec apiculo undulato instructis, petalis interioribus conspicue cuspidatis recedit.

Arbor 15 m. alta, cortice rugoso griseo. *Ramuli* annotini cinerei, rugosuli, manifeste lenticellati, 2·5 mm. diametro 15 cm. infra apicem, glabri; ramuli novelli basi perulati, perulis exterioribus margine ciliolato excepto glabris, interioribus extra densissime sericeis, dense patule pilosi. *Folia* nondum matura, oblonga vel obovato-oblonga, 4–6·5 cm. longa, 1·7–3 cm. lata, basi subcordata, apice rotundata, retusa vel apiculata, utrinque in nervis et subtus densius subappresse pilosa; nervi laterales utrinque circiter 11; petioli 2–3 mm. longi. *Flores* solitarii, circiter 8 cm. diametro. *Pedunculi* ex gemmis perulatis propriis vel ex parte inferiore ramulorum novellorum orti, 2–2·7 cm. longi, dense pilosi; bracteola 0·5–1 cm. infra apicem pedunculi sita, basi amplexicaulis, ovato-orbicularis, rotundata, valde concava, circiter 7 mm. diametro, extra dense sericea, intus glabra. *Sepala* lanceolato-oblonga, 1·3–1·4 cm. longa, 5–6 mm. lata, valde crispata, viridia, brunneo-maculata, extra densiuscule pilosa, intus glabra. *Petala exteriora* anguste oblonga, 4·2–4·8 cm. longa, circa medium leviter angustata, apice irregulariter obtusa vel rotundata, supra basin rotundata, valde

crispata, intense lutea, apice rubra, basi alba, superne 0·9–1·2 cm., circa medium 7 mm., inferne 1-1·1 cm. lata. *Petala interiora* ungue 5 mm. longo 2 mm. lato; limbus late deltoideo-reniformis, apice cuspidatus, 7-8 mm. longus, 1·1–1·2 cm. latus, utrinque intus grossius appresse pilosus, cuspide 1·5–2 mm. longo. *Antherae* oblongae, in basin paullulum angustatae, 0·8 mm. longae, connectivo apice applanato-capitato minute piloso loculis aequilato.

Tropical Africa. Portuguese East Africa: Moçimbua, *Stocks* 96.

1562. **Malvastrum puniceum,** *Jesson* [Malvaceae]; *M. capensi,* Garcke, arcte affinis, sed planta fere glabra, floribus minoribus, colore fusciore, petalorum ungue breviore, bracteolis saepe 4, sepalis abrupte acuminatis vel subacutis facile distinguenda.

Planta frutescens. *Ramuli* cortice rubro vel rubro-brunneo instructi, pilis albidis parcis obtecti. *Folia* ovato-oblonga, apice obtusa, basi subacuta, 2–4 cm. longa, 1·3 2·7 cm. lata, utrinque glabra, plus minusve trilobata, lobo medio longissimo, lobis lateralibus rotundis vel obsoletis, margine inequilateraliter dentata, nervis lateralibus 3–4 subtus prominulis; petiolus circiter 3–7 mm. longus, pilis parcissime instructus; stipulae parvae, lanceolatae, acutae. *Pedunculi* axillares, 1-flori, 1·5–3 cm. longi. *Flores* punicei. *Involucra* 3 4-foliata, foliis 5 mm. longis linearibus acutis. *Sepala* obovata, abrupte acuminata, 7 mm. longa, 5 mm. lata, pubescentia. *Petala* plus minusve imbricata, 1 cm. longa, 1·3 cm. lata. *Fructus* 5 mm. diametro, carpellis transverse rugosis, seminibus reniformibus.

South Africa (?)

The plant described above was received from Sir John Ross of Bladensburg, Rostrevor, Ireland, where it flowered in August, 1915. Sir John originally received the plant from Glasnevin under the name of *M. capense.*

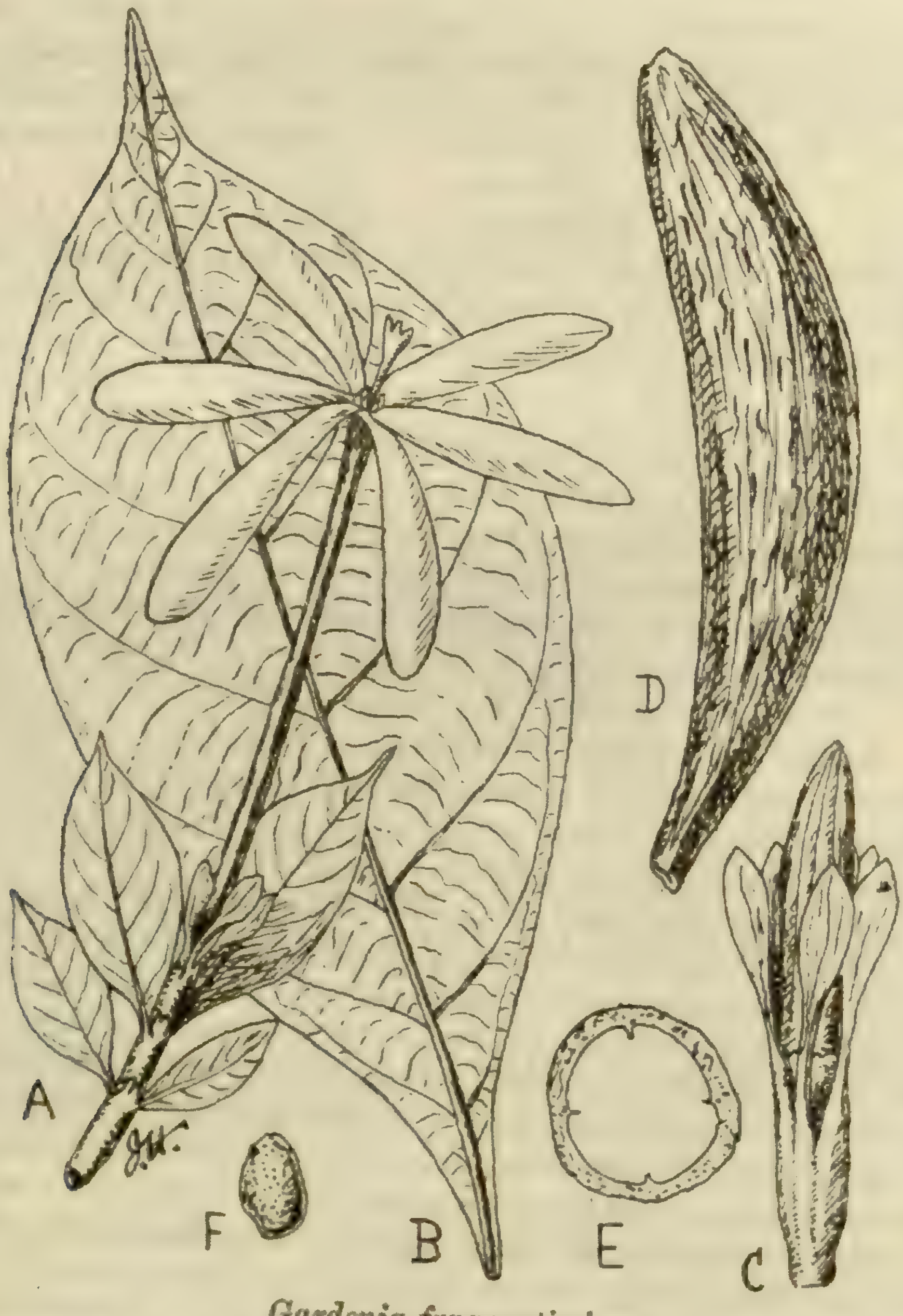
1563. **Gardenia fragrantissima,** *Hutchinson* [Rubiaceae–Gardenieae]; affinis *G. Vogelii,* Hook.f., sed foliis brevioribus, calycis lobis spatulato-obovatis foliaceis, stylis exsertis, fructibus brevioribus et latioribus differt.

Frutex circiter 2·25 m. altus (*Brown*); ramuli breves, cortice cinereo primum parce setuloso demum glabro obtecti. *Folia* oblongo-elliptica vel obovato-elliptica, obtuse caudato-acuminata, basi in petiolum brevem alatum attenuata, 4–12 cm. longa, 2–4·5 cm. lata, chartacea, glabra, subnitida; costa utrinque prominens; nervi laterales utrinsecus 5–10, a costa sub angulo lato arcuati, graciles, utrinque prominentes, intra marginem conjuncti; nervi tertiarii utrinque conspicui, subparalleli; veni prominuli; petioli 0·3–1·3 cm. longi, glabri; stipulae intrapetiolares, tubulosae, bilobae 5 mm. longae, coriaceae, extra parce setulosae. *Flores* solitarii, sessiles, subpraecoqui. *Receptaculum* oblongum, glabrum. *Calyx* tubulosus; tubus 1 cm. longus, glaber; lobi 6, foliacei, spatulati, 1·5 cm. longi, 4–6 mm. lati, chartacei, promi-

nenter 6–7-nervi, glabri. *Corolla* alba, fragrantissima; tubus cylindricus, 8–9 cm. longus, sicco et complanato 3 mm. latus, extra glaber, intus adpresse pilosus; lobi 6, lineari-oblongi, obtusissimi, prominenter striati, 4·5–5 cm. longi, circiter 1 cm. lati, glabri. *Antherae* fere inclusae, 1 cm. longae. *Stylus* breviter exsertus, apice crassus et trilobulatus, infra apicem breviter pubescens. *Fructus* durus, sessilis, fusiformis, longitudinaliter rugosus, 7–9 cm. longus, 1·8–2 cm. diametro, exocarpio 2·5 mm. crasso, endocarpio tenue nitido; placentae 4, tenues; semina complanata, suborbicularia, arcte maculata, 4 mm. lata.

Tropical Africa. Sierra Leone: near Kambia, Scarcies river, Jan., fr., *Scott Elliot* 4410; Makump, July, fl. and fr., *Thomas* 934; Jigaye, Sept., *Thomas* 2483. Gold Coast: Insunam, Jan., fl., *T. W. Brown* 132.

This species is very similar in general appearance to *G. Vogelii*, Hook. f., from the Southern Provinces, Nigeria, but is easily separated by the characters given above. According to T. W. Brown the flowers are white and very fragrant.



Gardenia fragrantissima.

A. Flower, × ½; B. Leaf, nat. size; C. Flower-bud, nat. size; D. Fruit; E. Section of same showing the four placentae, nat. size; F. Seed, × 2½.

1564. **Microlecane carinata,** *Hutchinson* [Compositae-Helianthoideae]; affinis *M. abyssinicae*, Benth., sed pedunculis glabris, involucri bracteis exterioribus longioribus glabris, interioribus dorso lacerato-carinatis nec pubescentibus differt.

Herba usque ad 1 m. alta; caulis erectus, basi lignosus, subteres, glaber, internodiis 5–10 (plerumque 7–8) cm. longis. *Folia* opposita, profunde bipinnatisecta, 4–7 cm. longa, usque ad 3 cm. lata, segmentis linearibus subacutis glabris; petioli basi amplexicaules. *Capitula* laxe corymbosa; pedunculi gracillimi, usque ad 7 cm. longi. *Involucri* bracteae 2-seriatae, bracteis exterioribus circiter 10 foliaceis linearibus subacutis vel fere obtusis 4–4·5 mm. longis 0·75 mm. latis, interioribus basi connatis ovatis subobtusis 3·5 mm. longis 2·5 mm. latis medio subcarnosis marginibus late membranaceis dorso lacerato-carinatis. *Flores radii* circiter 7, flavi, 2–2·5 cm. expansi; corollae tubus brevissimus, glaber; limbus oblongo-ellipticus, apice minute 5-denticulatus, 1 cm. longus, 0·6 cm. latus, 10-nervius. *Flores disci* numerosi; corollae tubus inferne cylindricus, superne leviter ampliatus, 2 mm. longus, glaber; lobi ovati, subobtusi, 0·75 mm. longi; antherae 1·25 mm. longae. *Achaenia* ambitu late obovoidea, leviter compressa, 0·4 mm. longa, glabra. *Pappus* nullus. *Receptaculi* squamae ellipticae, 3 mm. longae, 1·5 mm. latae, membranaceae, conspicue trinerviae, glabrae.—*Microlecane sp.*? Oliver & Hiern in Oliv. Fl. Trop. Afr. vol. iii. p. 386, in obs.; *M. var. forma elongata, etc.*, Vatke in Linnaea, vol. xxxix. 497.

Tropical Africa. Abyssinia: Gondar and vicinity, *Massey* 74; near Gaffat, *Schimper* 1386. Uganda: Gangi, base of rocks near cultivation, *Grant*.

1565. **Utricularia papillosa,** *Stapf* [Lentibulariaceae]; e grege *U. tribracteatae*, Hochst., sed pedunculo, bracteis, bracteolis, calyce papilloso-puberulis insignis.

Herba terrestris, delicata, nana, 4–8 cm. alta, rhizoideis e pedunculi basi ortis filiformibus fasciculatis brevibus. *Folia* et utriculi ignota. *Pedunculus* erectus, filiformis, simplex, superne papilloso-puberulus, 1–3-florus, floribus distantibus; bracteae basi gibbosulae bracteolaeque simillimae, aequilongae, ovatae vel ovato-lanceolatae, breviter acuminatae vel acutae, 0·5–1 mm. longae, inferiores steriles, omnes papilloso-puberulae; pedicelli ad 1 mm. longi, saepe breviores. *Sepala* subaequalia, nisi superius longius, sub anthesi circiter 1·5 mm. longa, demum aucta, interdum ad 3 mm. longa, late elliptico-ovata, subobtusa vel superius acutum et saepe ob apicis margines inflexos spurie acuminatum, eodem indumento ac bracteae. *Corolla* purpurea, 4–5 mm. longa; labium superum e basi dilatata lineari-oblongum, emarginatum, quam sepalum superum duplo longius; labium inferum subquadratum, deflexum, ad 3 mm. longum, crenulatum, ad fauces palati erecti minute tuberculato-costatum; calcar rectum vel leviter curvatum, horizontale, e basi lata tenue, subacutum, labium inferum fere duplo superans et ei parallelum.

Filamenta brevia, filiformia. *Stigmatis* labium inferum rotundatum. *Capsula* ellipsoideo-globosa, 2·5 mm. longa.

Tropical Africa. Nigeria: Northern Provinces; In bush pools near Abinsi, *Dalziel* 731, 732.

1566. **Caralluma carnosa,** *Stent* [Asclepiadaceae], affinis *C. acutilobae*, N.E. Br., sed caulibus carnosis majoribus, corolla campanulata lobis latioribus, corona exteriore gynostegium longe excedente praecipue distinguitur.

Caules erecti vel ascendentes, basi ramosi et decumbentes, 6–15 cm. alti, usque ad 4·5 cm. diametro, superne leviter angustati, glabri, griseo-virides, brunneo-purpureo-maculati, quadrangulares; anguli dentibus patentibus acutis apice callosis usque ad 1·25 cm. longis instructi. *Flores* 1–3 aggregati, inter angulos irregulariter dispositi. *Alabastra* subglobosa, angulis in dentes 5 productis; pedicelli 1–2 mm. longi. *Sepala* ovata, acuminata, 4 mm. longa, glabra, margine membranacea, viridi-flava, intus indistincte lilacino-maculata. *Corolla* 7–9 mm. longa, 0·8–1 cm. diametro, campanulata, carnosa, viridi-lilacina, extra indistincte purpureo-maculata, intus intense cremea, dense papilloso-verrucosa, atrorubro-maculata, in tubo distinctissimo maculis minoribus; annulus pentagonus, pulvinatus, valde sulcatus; lobi deltoidei, acuti, rigide erecti, 5 mm. longi, 5 mm. lati. *Corona exterior* crateriformis, 3 mm. longa, gynostegium excedens, lobis cremeis purpureo-maculatis coronae interiori lateraliter adnatis. *Coronae interioris* lobi ligulati, dorso carnoso-gibbosi, incumbentes, antheras haud excedentes, 1 mm. longi, cremei, purpureo-maculati, margine maculis interdum in lineam purpuream confluentibus.

South Africa. Transvaal: Zilikats Nek; Magaliesberg Range, *I. B. Pole Evans*, U.D.A. Herb. No. 11,020.

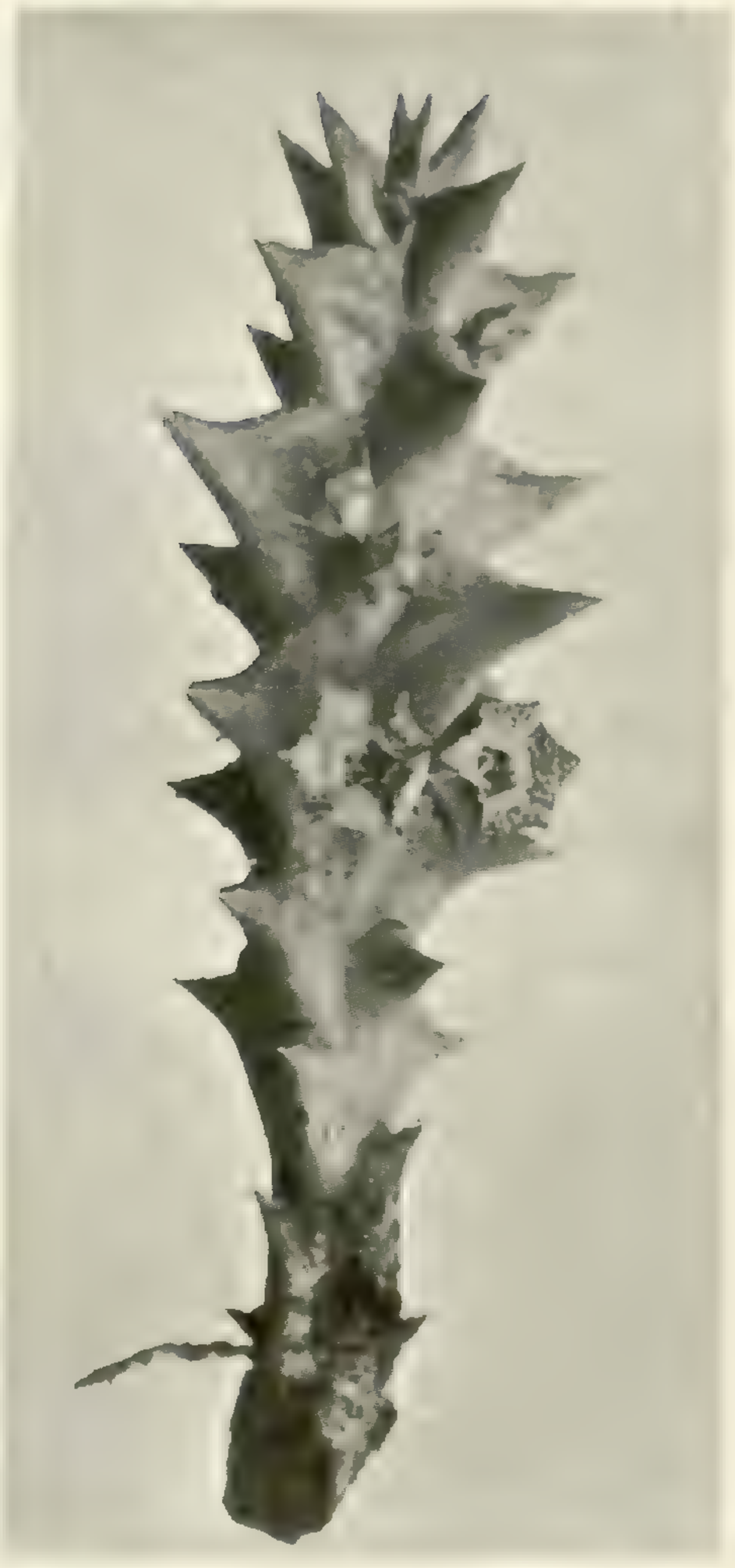
The plate (Plate I.) is from photographs taken in the garden of the Botanical Laboratory, Pretoria, by Mr. Pole Evans, Feb. 1914. The plants were collected at Zilikats Nek.

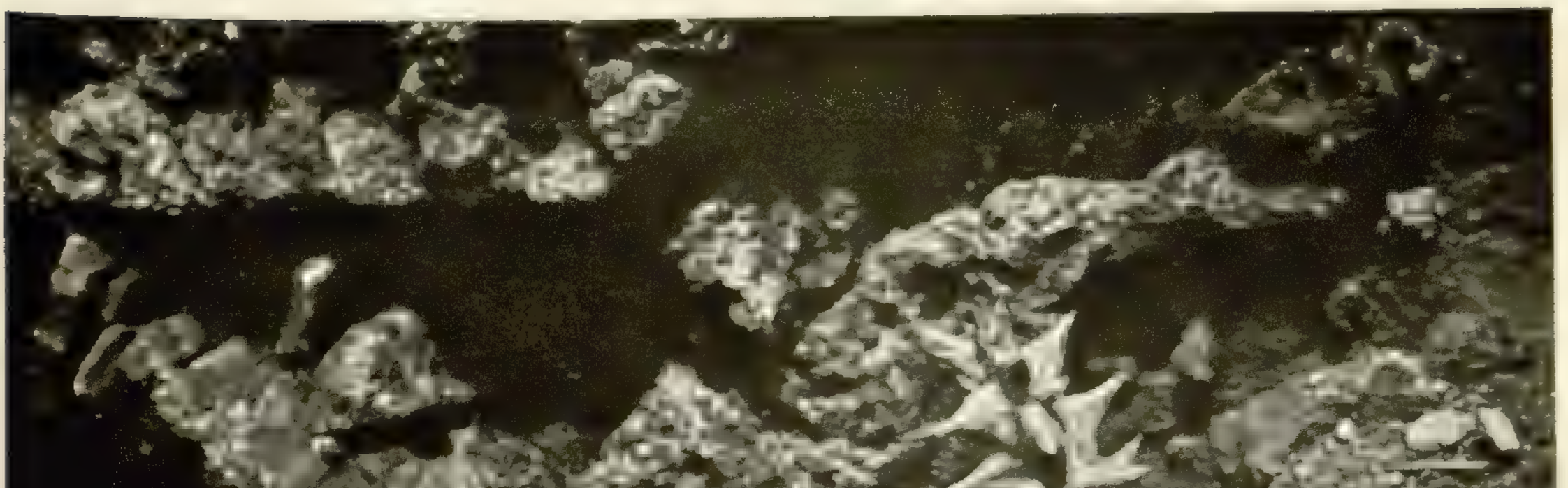
1567. **Struthiola ericoides,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 34, anglice [Thymelaeaceae-Euthymelaeeae]; species ex affinitate *S. erectae*, Linn., foliis oblongis obtusis crassis quadrifariis differt.

Rami primum dense pubescentes, demum glabri prominente cicatricosi, internodiis brevibus. *Folia* stricte quadrifaria, oblonga, 5 mm. longa, 1·5 mm. lata, obtusa, primum ciliata. *Flores* axillares prope caulis apicem; bracteolae 1 mm. longae, lanceolatae, obtusae, costa crassa, marginibus membranaceis ciliatisque. *Calyx:* tubus glaber, 9 mm. longus, supra gradatim ampliatus; lobi ovati, 2 mm. longi, 1·5 mm. lati, obtusi. *Petala* 8, quam calycis lobi dimidio breviora, crassa, pilis circumdatis superantia. *Antherae* connectivo acuminato instructae. *Ovarium* oblongum, glabrum; stylus filiformis, 6 mm. longus; stigma penicillatum.

South Africa. Riversdale Div.; Milkwoodfontein, 183 m., *Galpin* 4509.

PLATE I.





CARALLUMA CARNOSA.

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1568. **Struthiola floribunda,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 35, anglice [Thymelaeaceae-Euthymelaeeae]; species *S. longiflorae,* Lam., affinis, foliis oblongis obtusis pilosis differt.

Caulis ramosus; rami primum pubescentes. *Folia* opposita, approximata, oblonga, obtusa, ·7 mm. longa, 1·5 mm. lata, primum pilosa, demum dorso verrucosa. *Flores* axillares, secundum ramos dispositi; bracteolae 6 mm. longae, 0·6 mm. latae, oblongae, obtusae, longe ciliatae. *Calyx:* tubus pubescens, 1·7 cm. longus, tenuis; lobi oblongi, obtusi, 5 mm. longi, 2 mm. lati. *Petala* 8, oblonga, 1·5 mm. longa, pilis aequilongis circumdata. *Antherae* obtusae. *Ovarium* oblongum, glabrum; stylus filiformis, 9 mm. longus; stigma penicillatum.

South Africa. Clanwilliam Div.; Zekoe Vley, *Schlechter* 8506. Without precise locality, *MacOwan* 2470.

1569. **Struthiola Schlechteri,** *Gilg* ex *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 34, anglice [Thymelaeaceae-Euthymelaeeae]; species *S. leptanthae,* Bolus, affinis, foliis imbricatis non patentibus oblanceolatis differt.

Frutex ramosissimus. *Rami* primum pubescentes, demum glabri prominente cicatricosique. *Folia* imbricata, oblanceolata, 6 mm. longa, 1·5 mm. lata, pilis distantibus uniserialibus marginata, pilorum coma alborum terminata. *Flores* in axillis foliorum superiorum dispositi; bracteolae oblongae, foliis paullo longiores, 0·5 mm. latae, induplicatae. *Calyx:* tubus pubescens, 1·4 cm. longus, tenuis; lobi 4 mm. longi, 2 mm. lati, oblongi, acuti. *Petala* 8, purpurea, crassa, 1·5 mm. longa, pilis albidis brevioribus circumdata. *Antherae* 1 mm. longae, apiculatae. *Ovarium* oblongum, glabrum; stylus filiformis; stigma penicillatum.

South Africa. Calvinia Div.; Oorlogs Kloof, 670 m., *Schlechter* 10960.

1570. **Struthiola flavescens,** *Gilg* ex *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 35, anglice [Thymelaeaceae-Euthymelaeeae] species *S. rustianae,* Gilg, affinis, calyce pubescente differt.

Rami rubescentes, primum breviter pubescentes, mox glabrescentes. *Folia* imbricata, lanceolata, obtusa, 0·7–1·2 cm. longa, 2 mm. lata, glabra marginibus dense albo-ciliatis exceptis, coriacea. *Flores* in axillis foliorum superiorum dispositi, quam folia paullo longiores; bracteolae ovatae, obtusae, 2 mm. longae, apice albo-ciliatae, marginibus parte inferiori hyalinis. *Calyx* pubescens; tubus 7 mm. longus, apice 1 mm. diametro; lobi late ovati, acuti, 1 mm. longi. *Petala* 8, oblonga, quam calycis lobi breviora, pilis longioribus circumdata. *Antherae* oblongae, acutae, 1 mm. longae. *Ovarium* oblongum, glabrum; stylus filiformis, quam calyx brevior; stigma penicillata.

South Africa. Cape Div.; Devil's Peak, 581 m., *Kuntze.*

VII.—TWO LITTLE-KNOWN SOUTH AFRICAN EUPHORBIAS.

N. E. Brown.

(With Plate.)

Euphorbia pubiglans, *N. E. Brown* (see Plate II. fig. 1). This species is similar in general appearance to *E. clava*, Jacq., for which it has probably been mistaken, as dried specimens of it have been distributed mixed with *E. clava*. It differs from that species, as the figure shows, by the stem being covered with densely crowded subhemispherical tubercles, in the much shorter peduncles, and in the outside of the involucre being puberulous. It is also apparently a smaller plant, the stems of the specimens seen being only $3\frac{1}{2}$–12 in. high and $1\frac{1}{2}$–2 in. thick, with linear glabrous leaves $\frac{3}{4}$–$1\frac{1}{2}$ in. long, having the margins inrolled or folded together, and peduncles $\frac{2}{3}$–$2\frac{1}{2}$ in. long, bearing a whorl of 5 large bracts at the apex, forming a saucer-shaped cup $\frac{3}{4}$–1 in. in diameter surrounding the involucre.

The photograph, here reproduced, represents the plant about two-thirds the natural size, and was sent to Kew by Mr. J. L. Drège of Port Elizabeth, South Africa, of which locality the plant is a native.

Euphorbia enopla, *Boiss.* (Plate II. fig. 2). Although this species was described over 50 years ago, it has hitherto been very imperfectly known, as the original description is very unsatisfactory, having been made from mere scraps of branches collected by J. F. Drège, and the statement in De Candolle's Prodromus, vol. xv. pt. 2, p. 89, that it is a shrub 2–3 ft. high is not borne out by the original label or by the specimens. The photograph of the plant, here reproduced, sent to Kew by Mr. J. L. Drège, a grandson of its discoverer, shows the plant to be about one foot high, the picture being about one-third of the natural size. The *E. enopla* of Berger's Sukkulente Euphorbien, p. 93. is *E. heptagona*, Linn., and quite different from the true *E. enopla*, Boiss.; whilst the *E. heptagona* of that work is *E. pentagona*, Haw.

The branches of *E. enopla* are $\frac{7}{8}$–$1\frac{1}{4}$ in. thick and 6–7-angled. Its fierce-looking spines are modified peduncles, varying from $\frac{1}{2}$–$2\frac{1}{2}$ in. in length, and are at first very dark red, becoming blackish-purple and finally grey. The flowering peduncles are from $\frac{1}{4}$–1 in. long, and bear one very dark red involucre.

It is a native of South Africa, growing on the Witte Poort Mountains, in Willowmore Division, and on the Karoo, near Waterford and Aberdeen Road in Jansenville Division.

VIII.—CLEMATIS MEYENIANA.

T. A. Sprague.

The type specimens of *Clematis Meyeniana* were gathered by Meyen on the north-west coast of Lantao Island, near Hongkong,*

* Meyen, Reise um die Erde, vol. ii. pp. 189, 292.

PLATE II.

I.

II.

Fig. I. EUPHORBIA PUBIGLANS. *Fig.* II. EUPHORBIA ENOPLA.

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and were described by Walpers in 1843.* The distribution of the species and its varieties was extended by subsequent authors to Hupeh and Chekiang in the north, the Liukiu Islands, Formosa and Luzon in the east, Yunnan in the south-west, and Hainan and Indo-China in the south.† The wide conception of the specific limits and geographical distribution of *C. Meyeniana* which had thus obtained currency was accepted by Finet and Gagnepain in their revision of Asiatic species of *Clematis*; they separated the Hainan and Indo-Chinese material, however, as a distinct variety *granulata*.‡

Although this treatment of *C. Meyeniana* may be justifiable on theoretical grounds, and convenient in a monographic study, there is nevertheless much to be said for segregating two or three species from it in local floras and for horticultural purposes. The most distinct of these is *C. granulata*, J. R. Drumm. (var. *granulata*, Finet & Gagnep.), which may be distinguished at the first glance by the peculiar texture and surface of the leaflets, and which is not at present known to be connected with typical *C. Meyeniana* by any intermediate forms. *C. Pavoliniana*, Pamp.§ has also strong claims to specific status, and has been accepted as a distinct species by Rehder and Wilson.|| A specimen collected by Fortune at Amoy, however, though undoubtedly referable to *C. Pavoliniana*, does not differ much from certain specimens collected in Formosa and Luzon; and these in their turn are linked up with typical *C. Meyeniana* by other specimens from the Liukiu Islands and Luzon respectively. For this reason it appears desirable to adopt the wider conception of *C. Meyeniana* in the present paper and to recognise three varieties and two forms which may be distinguished as follows:—

A. Inflorescence a thyrse; rhachis and pedicels more or less pilose; sepals not distinctly longer than the stamens, usually not distinctly mucronate when expanded:
  Leaves smooth:
    Sepals not retuse ... *C. Meyeniana* (type).
    Sepals retuse ... ... forma *retusa*.
  Leaves roughened on both surfaces with raised points ... ... var. *granulata*.

B. Like A except that the sepals are much longer than the stamens ... ... forma *major*.

* Nov. Act. Nat. Cur. vol. xix. Suppl. 1. p. 297; Walp. Rep. vol. v. p. 3.

† Bentb. Fl. Hongkong p. 6; Maxim. in Mél. Biol. vol. ix. p. 397; Ind. Fl. Sin. vol. i. p. 9; Franch. Pl. Delav. p. 2; Diels in Engl. Jahrb. vol. xxix. p. 332; Ito et Matsum. in Journ. Coll. Sc. Tokyo, vol. xii. p. 271; Matsum. et Hayata, Enum. Pl. Formos. p. 5; Merrill et Rolfe in Philipp. Journ. Sc. vol. iii. p. 28.

‡ Bull. Soc. Bot. France, vol. l. p. 530; Lecomte, Fl. Gén. Indo-Chine, vol. i. p. 4.

§ Nuov. Giorn. Bot. Ital. n.s. vol. xvii. p. 279.

|| Sargent, Pl. Wils. vol. i. p. 328.

C. Inflorescence a thyrse or a raceme, or reduced to 3 flowers: rhachis and pedicels glabrous; sepals distinctly longer than the stamens, mucronate when expanded ... var. *insularis*.

D. Inflorescence a raceme, or reduced to 3 flowers; rhachis and pedicels glabrous; sepals distinctly longer than the stamens, usually not distinctly mucronate when expanded ... ... var. *Pavoliniana*.

Clematis Meyeniana, *Walp.* in Nov. Act. Nat. Cur. vol. xix. Suppl. 1, p. 297 (1843); Walp. Rep. vol. v. p. 3; Benth. in Hook. Kew Journ. Bot. vol. iii. p. 256; Fl. Hongk. p. 6; Seem. Bot. Voy. Herald, p. 361. *C. oreophila*, Hance in Walp. Ann. vol. ii. p. 3. *C. Hothae*, Kurz, For. Fl. Brit. Burma, vol. i. p. 17.

The original descriptions of *C. Meyeniana* and *C. oreophila* apparently correspond respectively to lower and upper portions of the plant. The sepals are usually acute or obtuse, rarely mucronate.

China. Lantao, *Meyen* (not seen). Hongkong, *Champion*, *Wright* 2, *Hance* 486; Victoria Peak, *Urquhart*. Islands near Macao, *Vachell* 254. Kwangtung, *Ford* 5; Canton,* *Fortune* 51. Fokien: Amoy Interior, *Swinhoe*. Yunnan: Szemao, in forests, 1350 m., *Henry* 12270. China, without locality, *Millett*.

Upper Burma. Hotha, east of the Kachin Hills, *Anderson*.

Forma **retusa,** *Sprague*; sepalis retusis, foliolis crassis ellipticis vel ovatis distinguitur.—*C. Meyeniana*, Hook. f. Bot. Mag. t. 7897, excl. syn.

Locality unknown. The plant is stated to have been received from the Hongkong Botanic Garden in 1885.

Forma **major,** *Sprague*; sepalis quam staminibus multo longioribus saepe retusis distinguitur.—*C. Craibiana*, Lace in Kew Bull. 1915, p. 395.

Kwantung. *Ford* 5a, *Ford*, Aug. 1887 (cult. in Hort. Kew. 1895); Lofoushan, *Ford* 103; North River, *Ford* 166 (type of the form). Upper Burma, Maymyo Plateau, *Lace* 6122 (inflorescence glabrescent).

Var. **granulata,** *Finet et Gagnep.* in Bull. Soc. Bot. France, vol. l. p. 530; Lecomte, Fl. Gén. Indo-Chine, vol. i. p. 4.

Hainan. *Henry* 8087, 8682. Indo-China: Tonkin; Laokai, *Wilson*, 2674. Laos; La-kon, *Harmand*—also recorded from Annam by Finet and Gagnepain, l.c.

Var. **insularis,** *Sprague*; inflorescentia glabra saepius racemosa vel triflora, sepalis quam staminibus manifeste longioribus

* teste Maximowicz in Mél. Biol. vol. ix. p. 597.

mucronatis distinguitur.—*C. Meyeniana*, Ito et Matsum. in Journ. Coll. Sc. Tokyo, vol. xii. p. 271; Matsum. et Hayata, Enum. Pl. Formos. p. 5; Merrill et Rolfe in Philipp. Journ. Sc. vol. iii. p. 98.

Liukiu Islands. *Wright* 1. Formosa. Tamsuy, *Oldham* 1 (type of the variety). Luzon. *Merrill* 4777, *Loher* 4.

Wright 1 and Loher 4 have the inflorescence a thyrse, and in this respect form a transition to typical *Meyeniana*.

Var. **Pavoliniana,** *Sprague.*—*C. Pavoliniana*, Pampanini in Nuov. Giorn. Bot. Ital. n.s. vol. xvii. p. 270; Rehder et E. H. Wils. in Sarg. Pl. Wils. vol. i. p. 328; Sprague in Bot. Mag. t. 8655, ined.

Szechuan. *Faber* 736. Hupeh. Near Ichang, *Henry* 714, 2744, 3529, 3529a; western Hupeh, *Wilson* 2a, 674, 416 (Arn. Arb.) Kiangsi. Kiukiang, *Shearer*. Chekiang. Ningpo, *Hancock* 15. Fokien, Amoy, *Fortune* 14; Foochow, *Carles* 559.

In conclusion it may be pointed out that much of the difficulty experienced in classifying the species and varieties of *Clematis* is due to the incompleteness of the specimens available for examination. The leaves and even the inflorescences often show considerable differences according to the part of the plant on which they are borne, and care should therefore be taken by collectors to obtain a *series* of specimens from the various parts of a single plant. Fruiting specimens and ripe achenes should, whenever possible, be gathered from a marked plant, from which flowering specimens have been previously obtained. In cases where the lateral shoots bear scale-leaves at the base, a specimen should be selected consisting of a piece of the main stem with at least two pairs of leaves and as much of the lower part of the lateral shoot as can be dried conveniently on the same sheet. Such a specimen will show the length of an internode of the main stem, and the base of the branch.

Although *C. Meyeniana* has been placed by Finet and Gagnepain among the eperulate species, it appears to have scale-leaves (perulae) at the base of its lateral shoots. In fact the difference between the "perulate" and "eperulate" groups of these authors does not seem to consist in the presence or absence of perulae, but in the inflorescences being borne on much-contracted leafless or leafy short-shoots in the former and on leafy long-shoots in the latter. The perulae are, however, naturally more numerous and more in evidence in the former group.

One variety, *Clematis Meyeniana* var. *heterophylla*, Gagnep..* remains to be dealt with. This has very large flowers and quinquefoliolate lower leaves, and has been referred to *C. quinquefoliolata*, Hutchinson† by Rehder and Wilson.‡ It is a native of Hupeh and Szechuan.

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* Vilmorin et Bois, Fruticet. Vilmorin.. Cat. Primar., pp. 2–3, cum ic.
† Gard. Chron. 1907, ser. 3, vol. xli. p. 3.
‡ Sargent, Pl. Wils. vol. i. p. 328.

IX.—EPIDENDRUM SECUNDUM AND E. ELONGATUM.

R. A. Rolfe.

A good deal of confusion centres round the species known under the names of *Epidendrum secundum*, Jacq., and *E. elongatum*, Jacq., and as the latter has recently been renamed *E. sulfuratorium*, E. H. L. Krause, it seems desirable that the history of the two species should be cleared up, especially as some allied species are involved in the confusion.

Epidendrum secundum, Jacq., is a West Indian plant, which was briefly characterised in 1760 as "foliis caulinis oblongis; spicis secundis; tubo nectario longitudine corollae." The old figure "Plum. Ic. 184, f. 1" is cited, but this, as will be presently shown, does not agree with the character given, and must be excluded. Somewhat later the plant was fully described and figured by Jacquin (Sel. Stirp. Amer. p. 224, t. 137), the habitat being recorded as mountains of Martinique. Plumier's old figure is again erroneously cited, for it belongs to the species next described and figured by Jacquin (*E. anceps*, Jacq., l.c. p. 224, t. 138), a view which is amply confirmed by coloured figures he afterwards published.

In 1803 a West Indian plant which flowered in the collection of E. I. A. Woodford, Esq., of Vauxhall, was figured under the name of *Epidendrum elongatum*, Jacq., by Sims, who cited "*E. secundum*, Herb. Banks." as a synonym. Sims was confident that his plant was *E. elongatum*, Jacq., notwithstanding a difference in colour, his own plant being purple, while that of Jacquin was more of a vermilion. This view was a mistaken one, though the confusion has continued down to the present.

In 1838 a plant which flowered in the collection of Sir Charles Lemon, at Carclew, was described under the name *Epidendrum lacerum*, Lindl. It had been introduced from Havana, and appears to be only a form of this species. Cogniaux retains *E. lacerum* and cites Porto Rico, Sintenis, no. 4021, 6909, but the former number was not so distributed, and I am unable to distinguish it from *E. secundum*. The latter I have not seen.

Epidendrum elongatum, Jacq., was described in 1789, being based on material collected at Caracas. Jacquin pointed out that the plant was near his *E. secundum*, but that the flowers were not secund, and were different in structure. An excellent coloured plate afterwards appeared, which, in spite of the subsequent confusion, leaves no room for doubt as to the plant intended.

In 1845 Lindley described a species under the name of *Epidendrum Lindenii*, basing it upon a plant which flowered with Messrs. Loddiges, of Hackney. It had been collected by M. J. Linden, on rocks near Merida, at an altitude of 5000 ft. He cited Linden's field number 636, and remarked, "From the ticket attached to the dried specimens, we learn that the plant appears in the form of three well-marked varieties; in one the flowers are of a bright carmine, in another rose-coloured, and in

a third of a yellowish-orange," none, however, quite identical with Messrs. Loddiges' plant, which bore the number 603. Lindley afterwards explained (Fol. Orch., Epidendr. p. 72). that these remarks belong, in part at least, to some other plant, and it may be added that he cited Linden 636 under both *E. Lindenii*, Lindl., and (p. 73) *E. xanthinum*, Lindl., a mistake clearly arising from his having wrongly mounted a second specimen of Linden's no. 636 on the same sheet as the Brazilian *E. xanthinum*. Loddiges' no. 603 was not preserved, but a pen-and-ink sketch on the sheet may represent it, as it is labelled *E. Lindenii*, but without any details.

Krause bases his *E. sulfuratorium* principally upon the West Indian plant figured in Bot. Mag. t. 611, which he regards as distinct from *E. elongatum*, Jacq., but he makes *E. secundum*, Jacq., identical with *E. ellipticum*, Graham (Hook. Exot. Fl. ii. t. 207), which is a Brazilian plant, received from Rio in 1824, and even were it otherwise the name *E. sulfuratorium* would be invalidated.

Lindley regarded *E. ellipticum*, Graham, as distinct, and although he has sketched a flower of a St. Vincent specimen on his sheet of *E. ellipticum*, he does not cite it, and probably afterwards detected his mistake. Cogniaux retains *E. ellipticum*, Graham, as West Indian, citing specimens from Guadeloupe, St. Vincent and Trinidad, but I have not seen them.

The following are the references to the two species:—

Epidendrum secundum, *Jacq.*, Enum. Pl. Carib. p. 29, excl. fig. cit. (1760); Sel. Stirp. Amer. p. 224, t. 137, excl. syn. (1763); Linn. Sp. Pl. ed. 2, p. 1349; Jacq. Amer. Pict. t. 207; Jacq. Amer. Gewachse, t. 242; Cogn. in Urb. Symb. Antil. vi. p. 519, pro parte.

E. elongatum, Sims, Bot. Mag. t. 611 (1803) non Jacq.; Bauer. Ill. Orch., Fruct. t. 11, fig. 6-9 (seeds); Lindl. Gen. and Sp. Orch. p. 108; Lindl. Fol. Orch., Epidendr. p. 73.

E. lacerum, Lindl. Bot. Reg. 1838, Misc. p. 17; Lindl. Fol. Orch,, Epidendr. p. 74.

E. ellipticum, Reichb. f. in Bericht. Deutsch. Bot. Gesells. iii. p. 277 (non Grah.).

E. sulfuratorium, E. H. L. Krause in Beih. Centralblatt. xxxii. ii. p. 336.

Amphiglottis secunda, Salisb. Hort. Trans. i. p. 294 (1812).

E. elongatum, *Jacq.*, Coll. iii. p. 260 (1789); Jacq. Ic. Rar. ii. p. 17, t. 604.

E. Lindenii, Lindl. Bot. Reg. 1845, Misc. p. 48 (pro parte); Lindl. Fol. Orch., Epidendr. p. 72.

The old reference, *Helleborine purpurea, umbellata*, Plum. Nov. Pl. Amer., Cat. p. 9; Pl. Amer., ed. Burm. ii. p. 170, t. 184, fig. 1 (excl. syn. Rumph.), is probably a mixture. The plate represents *E. anceps*, Jacq. (*E. fuscatum*, Swartz), but the name *Helleborine purpurea* cannot refer to that, as the flowers are snuff-coloured. It is probable that the two have been confused under the same name.

X.—MISCELLANEOUS NOTES.

Mr. J. R. Bovell.—We learn that Mr. J. R. Bovell who, we were informed, was leaving Barbados for British Guiana (*K.B.* 1915, p. 411), has not left the colony and retains his post as Superintendent of the Local Department of Agriculture.

Count Solms-Laubach, F.M.R.S., who died on November 24th, 1915, in his seventy-third year, was a most eminent botanist who had many warm friends in England and was well known at Kew, which he first visited in the early 'sixties as a guest of Sir William Hooker. His work on the history of cultivated plants brought him into close touch with the work of Kew, and his well-known investigation of the famous fossil, *Bennettites Gibsonianus*, was partly made on material then in the possession of the Kew establishment. An illuminated address, signed by many of his botanical friends in this country was presented to Count Solms in 1912, on his attaining the age of seventy.

D. H. S.

Sir Clements R. Markham, K.C.B., F.R.S., geographer and explorer, whose death in his eighty-sixth year took place as the result of an accident, on 29th January, 1916, was during that portion of his public career spent in the service of the Board of Control, 1855-8, and the India Office, 1858-75, a regular correspondent of Kew. This is not the place to speak of his efforts to advance geographical knowledge, but his endeavours to promote the economic interests of the Empire call for more than passing notice.

One of the consequences of a journey in Peru undertaken by Markham in 1852 was to direct his attention to the problems connected with the supply of Cinchona Bark, and one of the results of his subsequent connection with the India Office was his deputation to South America, towards the close of 1859, in order to effect the introduction of the quinine-yielding Cinchona of that continent to the East Indies. In this enterprise Markham had as associates Dr. R. Spruce, whose share in the work may be gathered from Spruce's "Notes of a Botanist on the Amazon and Andes," posthumously edited by the late Dr. A. R. Wallace, to which reference has incidentally been made in this Bulletin (*K.B.* 1909, p. 162), and Mr. R. Cross, whose share in the task is dealt with in a special report published in 1862. The enterprise, which was successful, was dealt with further by Markham himself in a number of special reports published during his service under the Secretary of State for India, while its incidents and its results were well summarised by him in a popular work on "Peruvian Bark"—an interesting account of the introduction of Cinchona cultivation into British India. The particular kind of Cinchona—which word Sir Clements insisted ought to be written Chinchona—that now forms the basis of the industry in the East was not introduced by Markham or Spruce or Cross, but

this accidental circumstance in no way detracts from the merits of the enterprise which Markham had so much at heart.

More than a decade later Markham was equally interested in the efforts then being made by Kew to introduce Para Rubber from Brazil to the East Indies. He was an intermediary in the communication of seeds obtained by Mr. J. Collins from a Mr. Farris, of Cameta, in 1873 (*K.B.* 1914, p. 163), and he was instrumental in arranging for the subsequent deputation to Brazil of his former coadjutor Cross with the object of obtaining a supply of living plants. In this case also it so happened that the supply of seeds which enabled Kew to lay the foundation of the Rubber industry in our eastern possessions came from an independent source, but this again was an accident which leaves the merits of Markham and of Cross unaffected.

While at the India Office Markham was a not infrequent visitor to Kew. After his retirement his visits were few, though on the occasion of his last one, paid in 1910, his interest in Cinchona generally and its cultivation in India was just what it had been when he demitted work at the India Office in 1877.

Canon H. N. Ellacombe.—By the death of Canon Ellacombe at Bitton Vicarage, in his ninety-fourth year, on February 7th, 1916, the science of horticulture has lost one of its most ardent and successful devotees and the world is the poorer in the loss of a very lovable personality whose mind was a rich storehouse of ripe experience and sound learning.

In the favoured garden at Bitton a wonderful collection of plants had been gathered together both from botanic gardens and from private friends, and out of the garden plants were given away with a truly magnificent generosity. Not least among the charms of Bitton Vicarage was the library stored with rare botanical and horticultural books whose contents were as accurately and exactly known to their owner as were those of the borders in the garden. In addition to his horticultural interests the Canon was a classical scholar of no mean parts and possessed a wide knowledge of English literature. His book on the Plants of Shakespeare is a typical example of the mingling of his tastes and interests and is a scholarly work of very real value. Somewhat similar accounts of the plants of Gower, Chaucer, Milton, and Spenser were published recently by him in the *Gardeners' Chronicle*. The Canon was a prolific writer and possessed in particular a knowledge of old garden roses which formed the subject of some of his most interesting contributions. Under the hospitable roof of Bitton Vicarage keen lovers of plants from far and wide were always welcome and its unique and most truly botanic garden is enshrined in many hearts as "a pleasant spot." This is not the place to speak of the personal charm of Canon Ellacombe, but we mourn the loss of one who, though he almost attained the age of 94, was ever young and active in mind and retained until near the end the keen interest, retentive memory and fine intellect which filled his own life with happiness, and were ever a source of stimulus and enjoyment to his intimate friends.

The February Gale at Kew.—During the strong gale of February 16th, which reached its climax between noon and 3 p.m., considerable damage was done at Kew. Two Lombardy poplars growing in the long row of these trees that skirts the wall of the Kew Palace Grounds near the river, were blown across the wall. For many years a pair of Lombardy poplars standing at the river end of the Sion Vista, close to the ha-ha, have withstood the south-westerly gales to which the position is fully exposed. But this gale proved too much for one of them, which came down about 3 p.m. A large elm near Kew Palace, apparently in perfect health and quite sound, was uprooted, as was also another on the bank of the ha-ha near Brentford Gate. For a long time past only a shell of the trunk of the historical elm on Queen Elizabeth's lawn has remained, sufficient however to show its extraordinary size when the tree was in its prime. This tree is supposed to have associations with Queen Elizabeth. Part of the shell with its branches attached was blown out on February 16th and but little now is left.

W. J. B.

Botanical Magazine for January.—The plants figured are *Eria ornata*, Lindl. (t. 8642), from Malaya; *Rhododendron erubescens*, Hutchinson (t. 8643), from Western China; *Chrysanthemum foeniculaceum*, Brouss. ex Willd. (t. 8644), a native of Tenerife, and *Funkia lancifolia*, Spreng. var. *tardiflora*, Hort. (t. 8645), probably from Japan.

Botanical Magazine for February.—The plants figured are *Eucharis Lowii*, Baker (t 8646); from West Tropical America; *Sophora macrocarpa*, Smith (t. 8647), from Chile; *Lobelia Holstii*, Engl. (t. 8648), from Tropical East Africa; and *Rhododendron hypoglaucum*, Hemsl. (t. 8649), from Western China.

Botanical Magazine for March.—The plants figured are *Aristolochia Lawrenceae*, N.E.Br. (t. 8650), from the Argentine; *Alpinia Elwesii*, Purrill (t. 8651), from Formosa; *Chamaedorea nana*, N.E.Br. (t. 8652), from Costa Rica; and *Androsace coccinea*, Franch. (t. 8653), from S.W. China.

Illustrations of New Zealand Plants.—This is the title of a handsome botanical work of two quarto volumes, issued by the Educational Department of the Government of New Zealand, as an atlas to Mr. T. F. Cheeseman's "Manual of the New Zealand Flora," which appeared in 1906. Equipped with these two publications, the student, possessing a knowledge of the rudiments of classification, will be able to identify most of the

important native flowering plants and ferns of New Zealand, without other help. The plates number 250, and the selection of subjects seems to have been made with sound judgment and such a complete knowledge of the flora as probably no other than the author can claim. Upwards of seventy families are illustrated and a proportionate number of genera and species. Characteristic families, genera and species preponderate. Umbelliferae occupy 12 plates; Compositae, 33; Epacridaceae, 9; Scrophulariaceae, 12; Orchidaceae, 9; Cyperaceae, 9; Gramineae, 17, and Ferns, 15. By this means the leading genera are identifiable from figures, and others partly by elimination. On the other hand 32 families are represented by one plate each. Large genera are represented by a selection of species covering the whole chain and extremes of differentiation. Thus, of Ranunculus, 5 species are given; of Carmichaelia and allies, 7; Epilobium, 5; Coprosma, 6; Olearia, 7; Celmisia, 7; Dracophyllum, 4; Gentiana, 5; Myosotis, 5; Veronica, 10, and Pimelea, 4. No formal descriptions are given of the plants figured, but the letterpress is replete with information of a useful and interesting character, varying in length from one to rarely half-a-dozen pages—the Kauri, for example.

In consequence of the impossibility of finding a competent botanical artist in New Zealand, arrangements were made with Kew for the drawings and lithographs to be done at the Herbarium, under the supervision of Dr. W. Botting Hemsley, from specimens supplied by Mr. Cheeseman. All the drawings were made by the Kew Artist, Miss Matilda Smith; the lithographs by Mr. J. N. Fitch, and the printing was done by Messrs. West, Newman & Co. As to the quality of the plates, it may be asserted that they are excellent and well adapted for educational purposes, the detail being exceptionally good. On this point Mr. Cheeseman expresses himself in the following words:—"I think that all capable judges will agree with me in saying that the plates contained in these volumes will enhance her already well-earned reputation."

Flora of the Nilgiri and Pulney Hill-tops.—In his Preface, dated November, 1897, to the last volume of the *Flora of British India*, Sir Joseph Hooker expressed the hope that his great work would "facilitate the compilation of local Indian Floras." He had already mentioned those which had appeared during its publication, the chief of which were: As a General Flora, Dr. Trimen's *Handbook of the Ceylon Flora*, which he himself completed after Dr. Trimen's death; and, as Forest Floras, Mr. Kurz's *Forest Flora of Burma*, Dr. Brandis' *Forest Flora of North-West and Central India*, and Col. Beddome's *Flora Sylvatica of Southern India and Ceylon*.

Since Sir Joseph Hooker wrote in 1897 much work has been done for Indian local Floras; of General Floras, Dr. Cooke's *Flora of the Presidency of Bombay*, and Sir D. Prain's *Bengal*

Plants have appeared, Mr. J. F. Duthie's *Flora of the Gangetic Plain* is approaching completion, and a *Flora of the Madras Presidency* has been begun; while of Forest Floras there have been published Mr. H. H. Haines' *Forest Flora of Chota Nagpur*, Mr. T. F. Bourdillon's *Forest Trees of Travancore*, and Rai Bahadur Upendramatu Kanjilal's *Forest Flora of the Siwaliks and Jaunsar* in the United Provinces. Relating to a less wide area, Sir Henry Collett's *Flora Simlensis*, designed to help residents at Simla interested in Botany to identify the plants they may meet with in their walks about the Hill Station of Simla, appeared in 1902, and now has just appeared, prepared with a similar object, a *Flora of the Nilgiri and Pulney Hill-tops*, by Mr. P. F. Fyson, the Professor of Botany in the Presidency College at Madras.

Mr. Fyson's book consists of two volumes, one for the letterpress of his Flora, the other for selected drawings illustrating the chief Families and Genera and the more characteristic plants of his area. That area "consists of the two plateaus, especially of the parts from Kotagiri to Ootacamund (Nilgiris) and near Kodai Kanal (Pulneys), which range from 6500 to 8500 ft. above sea-level." The number of species described is nearly 500, of which 430 are considered indigenous, and it certainly is one of the notable features of the book that it includes so many plants which have succeeded in acclimatizing themselves in the beautiful climate of the South Indian mountains. Visitors to those mountains are at once struck by the number of introduced plants. Apart from the Australian trees, chiefly Eucalyptus and Acacia, that now replace many of the indigenous woods, the visitor may see the Gorse and Broom, the Calla Lily, *Zephyranthes*, Pelargoniums, species of *Oxalis*, the Foxglove, American Verbenas, *Fuchsia fulgens*, two brightly-flowered Cassias, and perhaps most conspicuous of all, but not mentioned by Mr. Fyson, seedling Dahlias of every shade of red and yellow. It was quite right to include most of these as they have clearly come to stay.

About eleven new species are published, four species of *Eriocaulon*, three of *Crotalaria* and one each of *Lasianthus*, *Anaphalis*, *Olea*, and *Ancilema*, but the diagnoses of most, if not all of them, have already appeared in the *Kew Bulletin*.

The book is largely interspersed with notes of interest on floral mechanism and economic properties, for the benefit of those who use the book, but in some cases the editing seems to have been rather careless, as, for instance, under Rhododendron, where it is stated that "the Rhododendrons of English gardens have nearly all sprung from seed collected by the late Sir Dr. J. H. Hooker (*sic*) in the Sikkim Himalaya" and under *Viscum* that *Viscum japonicum*, Thunb. (Mr. Fyson has overlooked the writings of Van Tieghem and Engler which have ended in this plant being now referred to *Korthalsella*) "grows on *Eurya Rhododendron*, *Microcarpa*, *ovalifolia*, *etc.*" Presumably, the two latter are intended for two well-known species of *Microtropis*.

The drawings which comprise the second volume are rather

unequal in execution, but many of them are very good representations of the plants and will be most useful helps in the speedy identification of specimens collected. The greater number of these illustrations were prepared by Lady Bourne as accompaniments to the Herbarium formed by herself and her husband, Sir A. G. Bourne, F.R.S., lately Director of Public Instruction in Madras, by Mrs. Harrison, Mrs. Paton, Mrs. Fyson, by a young Indian artist Mr. R. Natesan, and by others, while Mr. Fyson himself seems to have contributed a great many. It is satisfactory to know that the Bourne Collection, chiefly of Pulney plants, has been presented to the Kew Herbarium, where the specimens should prove most useful, as the Pulney Hills have hitherto been somewhat poorly representd.

J. S. G.

The Cherries of New York.*—This work, a copy of which has lately been presented to the Library of the Royal Gardens, Kew, by the Director of the New York Agricultural Experiment Station, Geneva, N.Y., is the fourth of a series of monographs on popular fruits published by that institution. A notice of the previous one, *The Plums of New York*, appeared in the *Kew Bulletin*, 1912, p. 112. The very favourable terms in which that work was written of can only be repeated in the present instance. The botany of the common fruiting cherries as compared with that of the plums cultivated in North America is quite simple, for they have been derived almost wholly from two species, viz., *Prunus Avium*, the sweet cherry, and *P. Cerasus*, the sour cherry. *P. acida*, if considered to be a distinct species, would make a third, but it is usually regarded as a form of *P. Cerasus*. A single cultivated variety, "Early May," is also said to have been derived from the ground cherry, *P. fruticosa* (*P. Chamaecerasus*). North American cherry orchards are, therefore, almost entirely dependent on varieties derived from European species. The only New World cherry which has hitherto been shown to have much value as a fruit is *Prunus Besseyi* (Bot. Mag. t. 8156). Mr. Hedrick devotes about one hundred pages of his work to a most interesting discussion of his subject in its broad phases—historical, botanical and cultural. The first mention of the cherry in literature appears to have been by Theophrastus, writing about the year 300 B.C. Even then there is evidence that the cherry had been cultivated for several centuries. It was introduced to North America by the early settlers, and in 1909 we are informed that there were close upon twelve millions of fruit-bearing trees in the United States, which bore over four millions of bushels of fruit. Since then the industry has greatly increased. Perhaps the most important part of the work is Chap. iv., running to 108 pages. In this is given a description of all the leading varieties of cherry alphabetically

* The Cherries of New York. By U. P. Hedrick, New York Agricultural Experiment Station, Geneva, 1915. pp. 371, 400, with 56 coloured plates and portrait frontispiece.

arranged, fifty-six of them illustrated by admirable coloured plates. In addition to the description the history of each variety is given, together with notes on its qualities and cultivation. It is difficult to see how this part of the work could have been better done.

Although one might infer from the title that the work dealt chiefly, or only, with the subject from the point of view of New York State, it has really great value and interest not only for the whole of North America, but wherever the cherry is cultivated. No work, we believe, hitherto published vies with it in comprehensiveness.

W. J. B.

Drugs and Preparations.*—The disorganisation of Continental markets, causing irregularity or entire stoppage of supplies of many familiar products, including drugs, has directed attention to other possible sources or substitutes to meet the demand. In this connection the advent of the second edition of Potter's Cyclopædia is opportune, especially as it deals not alone with officinal drugs but also with many others more or less familiar to the herbalist. The information given is concisely arranged, as the following example will fully illustrate:—

Canella.

Canella alba, Murray.

N.O. *Canellaceae.*

Syn.—White Cinnamon.

Part used.—Bark.

Action.—Aromatic, stimulant, tonic. Useful in enfeebled conditions of the stomach and intestines. Generally given in combination with other stomachics. Dose, 10–40 grains.

Preparation.—Pulv. Aloes cum Canella (Hiera Picra). Dose, $\frac{1}{4}$–1 drachm.

Distinctive character.—Bark fawn coloured externally, chalky-white on inner surface, in quilled pieces $\frac{1}{4}$–$1\frac{1}{2}$ in. in diameter. Transverse fracture short, whitish with numerous bright orange-yellow dots composed of resin cells. Taste, biting, aromatic, slightly recalling that of cinnamon. Odour, aromatic.

The work is clearly printed, has a good index and a glossary of botanical terms. One omission of importance may be noted, viz., the geographical origin or sources of supply.

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* Potter's Cyclopædia of Botanic Drugs and Preparations. By R. C. Wren, F.L.S., with additions by E. M. Holmes, F.L.S. Second Edition. Pp. xl. + 339. Price 3s. 6d. Published by Potter & Clarke, Ltd., 60, 62 and 64, Artillery-lane, London, E.

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Continued on p. 3 *of cover.*]

ROYAL BOTANIC GARDENS, KEW.

Bulletin No. 9, 1915.

ERRATA.

Page 393, line 8 from bottom. *For* yulanicus *read* yunanicus
Page 397, line 19. *For* interdumoe *read* interdumve
Page 398, line 33. *For* laterali *read* lateralia; *and for* lanceolata- *read* lanceolato-
Page 401, between lines 6 and 7 from bottom. *Insert* usque ad 22 cm. longa, petiolo circa 4 cm. longo striato glandula
Page 403, line 10. *For* constitute *read* constituta
Page 403, line 16. *For* breviore *read* breviores
Page 403, line 25. *For* alba *read* albo
Page 404. *Delete* line 12, *and substitute* nervis transversis paucis inconspicuis; petioli ad 7·5 cm. longi.
Page 404, line 28. *For* Melastomaceae *read* Gentianaceae
Page 405, line 4. *For* instructis *read* instructus
Page 406, line 6 from bottom. *For* nervis *read* nervos
Page 406, line 5 from bottom. *Before* adpressis *insert* pilis

(4514.) Wt. 153-601. 1,125. 4/16. J. T. & S. G. 14.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 3] [1916

XI.—THE FLORA OF MADRAS.

The Flora of Madras, of which the opening instalment (pp. 1-200) dealing with the natural families *Ranunculaceae* to *Aquifoliaceae* has been issued, forms one of the series of local Indian Floras, the preparation of which was undertaken on the completion of the *Flora of British India* prepared at Kew by Sir J. D. Hooker during 1872-97. The author, Mr. J. S. Gamble, who was compelled to defer the inception of the task owing to his having undertaken to collaborate with the late Sir G. King in the preparation of the *Materials for a Flora of the Malayan Peninsula* and to his public spirited determination to continue that work after the death of his colleague is, by reason of his service in the Madras Presidency during his career as an Indian forest officer and his personal knowledge of the vegetation of a considerable portion of the area dealt with, especially competent to carry this new undertaking to a successful issue. That he has been able to supply a substantial instalment so soon is due, as the author explains in the introduction to Part I. to the circumstance that he had the assistance of Mr. S. T. Dunn, formerly Superintendent of the Botanical and Forestry Department, Hong Kong, in preparing the draft of the botanical portion of the first 132 pages, to the end of *Biophytum*, and that for the genus *Impatiens*, which follows, the results of the patient study to which Sir Joseph Hooker devoted the last years of his life were available for use. Owing to his other engagements the assistance of Mr. Dunn is no longer available and the rest of the task is therefore being undertaken by Mr. Gamble alone.

The method of presentation adopted is that followed in the corresponding work for Bengal, issued in 1903. The object of that method is to enable the ready identification of a species in the field by enabling the collector to ascertain with certainty the genus to which a plant belongs and, this object attained, by limiting his attention to those characters of the plant under

(4314.) Wt. 153-601. 1,125. 4/16. J.T.&S. G. 14.

examination which are necessary to its specific determination. This method has the advantages of saving space and time, both matters of consequence to the traveller. The work is exceedingly well printed and an examination of its descriptions and keys indicates that it should serve its special purpose well.

The preparation of an account of the species of any *Flora* dealt with in a fashion so succinct as that adopted in the *Flora of Madras* does not lessen the need for critical examination of the material on which it is based, but places an author at a disadvantage in cases in which he is compelled to adopt conclusions at variance with those arrived at by earlier workers with less adequate material at their disposal. These new conclusions can only be stated; to discuss the reasons on which they are based would be to defeat the very object which the method of presentation adopted has been devised to fulfil. At the same time it is often desirable that these reasons should be disclosed for the guidance of cabinet- as contrasted with field-botanists. In the present instance those cases in which new conclusions have been arrived at in that portion of this work drafted by Mr. Dunn, have been noted by him for Mr. Gamble's information and we are indebted to Mr. Gamble for the present opportunity of placing these on record.

NOTES ON THE FLORA OF MADRAS (S. T. DUNN).

RANUNCULACEAE.—*Clematis smilacifolia*, Wall. The S. Indian forms formerly referred to this name appear from the material now available to represent three species, one agreeing with Wallich's type, a second with Wight's *C. Munroana*, while the third, collected by C. B. Clarke in the Nilgiri Hills, has been described in the *Kew Bulletin* as new under the name of *C. theobromina*, Dunn (*K.B.* 1914, 181).

Roxburgh's original spelling of *C. gouriana* is with a small *g*, and, as his note "in the environs of the ancient city of Gour, it forms with *Porana paniculata* extensive, lovely festoons" (Fl. Ind. ii. 671) shows that the specific name is geographical, his spelling, according to the Vienna Rules, should be maintained.

Ranunculus diffusus, DC. A full series of the S. Indian Buttercups formerly referred to this name corroborate the view adopted by Wight and Arnott (Prodr. 4) that they represent a distinct species—*R. subpinnatus*, W. & A.

ANONACEAE.—*Cyathocalyx zeylanicus*, Champ. The petals in Champion's Ceylon specimens (the type) and in those from S. India are $\frac{1}{2}$ in. wide not $1\frac{1}{2}$ in. as stated in the Flora of British India (i. 53).

Polyalthia rufescens, Hook. f. & Thoms. The fruit of this species has not been described. The nearly mature carpels in a specimen in the Madras Herbarium collected in the Tinnevelly Hills are pisiform, $\frac{1}{3}$—$\frac{3}{4}$ in. in diameter and borne on stalks of about the same length.

Miliusa eriocarpa, *Dunn*, sp. nov. The common S. Indian tree described under the name of *M. indica* by Hooker f. and

Thomson (Fl. Ind. 148; Fl. Brit. Ind. i. 86) and by Wight and Arnott (Prodr. 10) and figured by Beddome (Pl. Ind. Or. t. 85) has been shown to me by Mr. J. R. Drummond to differ in so many respects from the figure and description of Leschenault's true *M. indica* (Lesch. in A. DC. Mém. Soc. Genèv. v. 36) that it is necessary to distinguish it under a separate name. As no such name has yet been published, I propose, with Mr. Drummond's concurrence, to call it *Miliusa eriocarpa*, Dunn, in reference to its velvety carpels.

Menispermaceae.—*Tiliacora acuminata*, Miers. The first description of the species was published by Lamarck under the name of *Menispermum acuminatum* (Encycl. iv. 101). Diels is, therefore, correct, under the Vienna rules of nomenclature, in restoring this specific name (Engl. Pflanzenr.—Menisp. 60). He attributes the combination, however, to Hooker f. and Thomson, but it was previously used by Miers (Ann. Nat. Hist. ser. 2, vii. 39).

Diploclisia glaucescens, Diels. This genus of Miers is revived by Diels for reasons clearly expressed in Engler's Pflanzenreich (Menisp. 224) and his new combination must be used. The species was first published under the name of *Cocculus glaucescens* by Blume (Bijdr. (1825) 25).

For similar reasons Diels rightly re-established (l.c. 236 and 237) the oldest specific names in *Cocculus hirsutus*, Diels (*Menispermum hirsutum*, Linn. Sp. Fl. ed. 1, (1753) 341) and in *C. pendulus*, Diels (*Epibaterium pendulum*, Forst. gen. (1776) 108), plants for long known as *C. villosus*, DC. and *C. Leaeba*, DC.

Stephania.—There are two species of this genus in the Madras area; one with flowers in umbellate heads, the other with solitary axillary heads or with condensed head-like cymes of flowers. The latter agrees perfectly with Arnott's type of *Clypea Wightii*, which consists of specimens bearing male flowers and ripe fruits, and is obviously distinct from Loureiro's *S. rotunda* with which, probably in consequence of the scantiness of the material, it was previously identified. The new combination of *S. Wightii* is therefore proposed for it. A slight disagreement with Diels's conclusions must be here noted: Diels (l.c. 272) places *Clypea Wightii*, Arn. under *S. glabra*, Miers, a species described by him (Diels) as having "*flores filiformi-pedicellati.*" In Wight's own specimen (no. 2462) in the Kew herbarium there is a detached male inflorescence, however, which is a peduncled head, and similar ones are in their natural position in the Calcutta specimen (Kew Dist. 45). Wight himself describes the male flowers as being "all collected into a single capitulum" (Ill. i. 22). Arnott's species cannot therefore, I think, be so placed, but must be provided with a distinguishing name in the genus as above. The other S. Indian species resembles *S. hernandifolia*, with which *S. japonica*, Miers, is closely allied. Diels (l.c. 277, 279) regards these two species as distinct by reason principally of their amount of or want of pubescence, *S. japonica* having glabrous inflorescences and leaves, while *S. hernandifolia* has puberulous inflorescences and leaves usually

tomentose on the veins. If kept separate on this account our plant is *japonica*, and if the two are combined, the same specific adjective must be used as having priority, the original description of the species in this sense being under the name of *Menispermum japonicum*, Thunb. (Fl. Jap. (1784) 195).

Cyclea.—There appear to be three species of *Cyclea* in S. India, very similar in habit and in foliage, but differing in the structure of their male flowers. By far the commonest and most widely diffused has globose or widely campanulate pubescent calyces, with 6–8 anther-cells on the rim of its peltate connective. This is the species described as *C. Burmanni*, Miers, in the Fl. Brit. Ind. i. 104. Miers did not use the combination in the place cited and Hooker f. and Thomson (Fl. Ind. 201) are the real authorities for this name, which is founded on *Cocculus Burmanni*, DC. (Syst. i. (1818) 517). But Diels, who had the opportunity of comparing a type with van Rheede's Malabar specimen previously described as *Menispermum peltatum* by Lamarck (Encycl. iv. (1797) 96) considered the two to be identical, and, as Rheede's figure (Hort. Mal. vii. t 49) quite agrees with this conclusion, Lamarck's specific name should be the one used. *Cyclea Burmanni*, Hook. f. & Thoms. and *Cyclea peltata*, Diels are synonymous and the fact that the combinations have been variously applied to three very different species in all the important works dealing with them during the last forty years has prepared the way for a complicated synonymy.

The combination *C. Burmanni* was applied by all authors up to the time of Diels's Monograph to the common globose-flowered species; to the second species having campanulate calyces and 4-5-celled androecia Hooker f. and Thomson wrongly applied the name *C. peltata*, while Miers (Contrib. iii. 236) used the same combination, also wrongly, to designate a third species having the male calyx divided nearly to the base into 4-5 segments. The second species received the distinctive name of *C. Arnottii* from Miers (Contrib. Bot. iii. 238), while for the third which was collected by Beddome in the Wynaad and has not previously been separately recognised, I propose the name *C. fissicalyx*.

The synonymy, as far as references to Madras plants are concerned, will be as follows:—

C. peltata, Diels, as in Engl. Pflanzenr. Menisperm. 312 omitting the synonym *C. Arnottii*, Miers.

C. Arnottii, Miers in Ann. Nat. Hist. ser. 3, xviii. 19, Contrib. iii. 238.—*C. peltata*, Hook. f. & Thoms. Fl. Ind. 201, Fl. Brit. Ind. i. 104; Diels l.c. 312 all in part.

C. fissicalyx, *Dunn.*—*C. peltata*, Miers, Contrib. iii. 236; Cooke, Fl. Bomb. i. 24 (not of Hook. f. & Thoms. nor of Diels).

Berberidaceae.—*Mahonia Leschenaultii*, Takeda. The S. Indian plant is probably specifically distinguishable from De Candolle's *M. napaulensis* by its globose glaucous-purple berries.

Nymphaeaceae.—*Nymphaea Lotus*, L. Conard does not in his Monograph identify any Indian plants with the *N. Lotus* of

the Linnean herbarium but he follows Wight and Arnott (Prodr. i. 17) in separating from it as distinct species, on account of the colour of their flowers, *N. rubra*, Roxb. and *N. pubescens*, Willd. After examining a large series of S. Indian Water-lilies, it is not considered possible to separate these two species, but they are distinct from *N. Lotus*, L. by the densely velvety under-surface of their leaves.

CRUCIFERAE.—*Cardamine trichocarpa*, Hochst. ex Rich. Tent. Abyss. i. 18 (1847) is identical with the Indian plant described afterwards as *C. subumbellata*, Hook. by Hook. f. & Anders. in Fl. Brit. Ind. i. 138 (1872). The latter name must therefore be superseded.

CAPPARIDACEAE.—In accordance with the present International Rules of nomenclature, *Niebuhria linearis*, DC. and of most subsequent authors must have the original specific name of *apetala* (*Capparis apetala*, Roth, Nov. Sp. 238) restored, becoming **Niebuhria apetala**, *Dunn*.

Capparis aphylla, Roth. A type specimen collected at Palamcottah (Tinnevelly) on Oct. 26th, 1795, is in the Kew Herbarium.

C. grandiflora, Heyne. There is a form similar in all respects to the Wallichian type of this species except that the thorns are nearly straight and the twigs glabrous. But the only two specimens known to me are one in the Oxford Herbarium collected by Bulkley in 1703 at Fort St. George (Madras) and a second collected by Heyne in Mysore in 1801, and these are not sufficiently complete to admit of accurate description.

C. stylosa, DC. This is the Caper with straight thorns, flowers 2-5 in. across and large muricate fruit which was figured by Wight (l.c. t. 889) under the name of *C. divaricata*, Lam. Subsequent writers have followed this nomenclature. Lamarck had neither flowers nor fruit when describing his species, and it so happens that there are two S. Indian *Capparis* hardly distinguishable by their leaves and thorns but readily seen when in flower or fruit to be quite distinct. Lamarck mentions that in *C. divaricata* "Les aiguillons sont géminés, courts et crochus" (Encycl. i. 606) which would tend to show that it did not belong to the species figured by Wight and described by subsequent writers under that name. But, in any case, it is only safe to designate these two allied species by the names given to them afresh after flowers or fruit were known. The first name which can be definitely claimed for the large-flowered and rough-fruited kind is *C. stylosa*, DC. (Prodr. i. 246) the synonymy being *C. divaricata*, Wight & Arn. Prodr. i. 27; Wight l.c. t. 889; Hook. f. & Thoms. in Fl. Brit. Ind. i. 174. Similarly the second may safely be cited as *C. diversifolia*, Wight & Arn. Prodr. i. 27; Hook. l.c. Fl. t. 181; Hook. f. & Thoms. Fl. Brit. Ind. i. 175. *C. divaricata*, Lam. l.c. (possibly).

C. Cleghornii, *Dunn* sp. nov.—*C. Roxburghii*, Cooke, Fl. Bomb. i. 46 (exclud. syn.); Hook. f. & Thoms. in Fl. Brit. Ind. i. 175 (partly) not DC. Bombay Presidency: Canara, *Stocks*. Madras Presidency: Balabroydroog (?) *Cleghorn;*

Wight, Kew Distrib. No. 68; Mangalor, *Hohenacker* 420; Coorg *Hook. f. & Thoms.* Madras Coll. 72.

Distinguished from its nearest ally *C. Roxburghii*, DC. by its tomentose flower buds and divaricate leaf-veins.

C. grandis, Linn. f. This species was described from a Ceylon specimen with nearly glabrous leaves, but the usual form in S. India has a covering of close olive-green tomentum over all the young parts.

C. tomentella, *Dunn* sp. nov.—*C. parviflora*, Bedd. l.c. Pl. Ind. Or. i. 65 t. 176 (not of Hook. f. & Thoms.).

Travancore, *Beddome* 61, 243.

This species may be distinguished from *C. parviflora*, Hook. f. & Thoms. by its densely shortly pubescent (not glabrous) twigs and by its fully grown flower buds being ·2 in. instead of ·1 in. long.

C. rotundifolia, Rottl. Rottler first described this species (Gesellsch. Nat. Fr. Neue Schr. iv. (1803) 185) and after comparing this type, which is still extant in the Kew Herbarium, there seems no doubt that his plant was the one subsequently labelled *C. pedunculosa* by Wallich (n. 6999), described and figured in Hooker's Icones (t. 128), and quoted by most later writers.

Capparis zeylanica, Linn. The first species of *Capparis* to receive a binominal designation was the common hook-thorned species of Ceylon and S. India which has 2 or more flowers in supra-axillary rows and globular glabrous ovaries. It was collected by Hermann in Ceylon and came with his herbarium into the hands of Linnaeus, after being lost to the botanical world for about 70 years. This herbarium formed the foundation of the *Flora Zeylanica*. The collection consists of fragments of plants glued into 5 large volumes which now stand on the shelves of the Botanical Department of the Natural History Museum (Cromwell Road). They are the actual volumes referred to by Linnaeus as "*in forma atlantica*" (atlas folio) in the preface to the flora, and the specimens are his types. Specimens of the Caper named by him as above (Sp. Pl. ed. 2, 720 (1763)) occur twice in the herbarium and although two and a half centuries old are still in quite good condition and easily recognisable as the species afterwards known as *C. horrida*, Linn. f. The younger Linnaeus received specimens of the same species from Koenig and presumably not having seen Hermann's herbarium, and there being no specimen in his father's herbarium, published it again in 1781 under the latter binominal. This name was doubtless communicated to Koenig and became the recognised appellation of the Caper among his friends and their successors. Roxburgh reverted to the correct name, but Wallich, Wight and Arnott and all recent writers have followed the mistake of the younger Linnaeus.

But not only did the early botanists of S. India fail to apply Linnaeus's name to the common plant intended by him, they used it to indicate a perfectly distinct species. The mistake was followed by Willdenow, Wallich and most modern authors.

But De Candolle for the first time recognised that it really was a distinct species and gave it the name of *C. brevispina* and this name, which was adopted by Wight and Arnott and other botanists must stand. The synonymy will be as follows:—

C. brevispina, DC. Prodr. i. 246; Wight & Arn. Prodr. i. 24; Hook. l.c. Pl. t. 126. *C. zeylanica*, Hook. f. & Thoms. Fl. Brit. Ind. i. 174.

C. zeylanica, Linn. Sp. Pl. ed. 2 (1763) 720; DC. Prodr. i. 247; Roxb. Fl. Ind. ii. 567. *C. horrida*, Linn. f. Suppl. 264; Wight & Arn. Prodr. i. 26; Wight l.c. t. 173.

Violaceae.—*Ionidium suffruticosum*, Ging. Two forms of this variable plant occur in the Hermann Herbarium, the bushy pubescent one was called by Linnaeus *Viola suffruticosa*, the laxer and more glabrous specimens *V. enneasperma*.

Polygalaceae.—**Polygala bolbothrix,** *Dunn* sp. nov.—*P. cilata*, Wight & Arn. Prodr. i. 38 (not of Linn.).

This species, which is widely distributed in S.W. India, was recognised and fully described by Wight & Arnott (l.c.) but the binominal employed was not really available, having been applied by Linnaeus to a *Salomonia*. The specimen in Linnaeus's herbarium leaves no possible doubt on this point, and it has therefore become necessary to rename Wight & Arnott's species.

Polygala chinensis, L. There can be no doubt that the numerous forms usually collected under this name are rightly associated with the specimens so named in Linnaeus's herbarium. But the two erect simple plants which constitute his type have an abnormal appearance, owing apparently to the effect of some gall. The absence of a bearded crest, as described by Linnaeus, is probably due to the same cause.

Caryophyleaceae.—*Polycarpaea aurea*, Wight & Arn. in Ann. Nat. Hist. ser. 1. iii. 91.—*P. corymbosa*, Lam. var. *aurea*, Wight Ill. ii. 44 t. 110; F.B.I. i. 245; Cooke, Fl. Bombay, i. 66.

The distinct appearance of this species has led authors to make strenuous efforts to find characters definite enough to separate it practically from the innumerable other forms of this variable group. There is an old note on one of the Kew herbarium sheets representing it, and probably from Sir Joseph Hooker to J. Gay, "Can *you* not find characters to separate this beautiful plant from *P. spadicea* or *P. corymbosa?*" Such characters were evidently not discovered then and the form was relegated to a varietal status in the Flora of British India. From his knowledge of the plant in a wild state and his study of available dried specimens Mr. Gamble, however, advises me that the characters enumerated in the Key of this genus in the Flora of Madras are sufficient to distinguish it in the field as a well-marked species.

Elatinaceae.—*Bergia capensis*, Linn. Following the Index Kewensis and Cooke's Flora of Bombay (i. 74) the above name which was altered by Willdenow to *B. verticillata* on the ground that the adjective *capensis* was inappropriate to a plant not native at the Cape is now, in accordance with the International rules of botanical nomenclature, restored.

HYPERICACEAE.—*Hypericum Wightianum*, Wall. An examination of the good series of specimens now before me indicates that the above species should not be referred to *H. napaulense*, Choisy, being intermediate between that species and *H. elodeoides*, Choisy. Both of Choisy's species are founded on Wallich's specimens so that all three types were able to be laid side by side at Kew where the Wallichian herbarium is now preserved. *H. Wightianum*, Wall. may be readily distinguished from *H. elodeoides*, Choisy in its lowest leaf veins not reaching beyond the middle of the blade instead of extending nearly to the tip, and from *H. napaulense*, Choisy by its larger sepals which are about equal to the whole pistil when in flower and to the capsule in fruit instead of being equal to the ovary when in flower and to half the capsule when in fruit.

GUTTIFERAE.—**Garcinia tinctoria,** *Dunn. Xanthochymus tinctorius*, DC. is the oldest available name for the species; Roxburgh's *X. pictorius* is older but the trivial name is preoccupied in *Garcinia* by *G. pictoria*, Roxb. which is a different species.

Garcinia spicata, Hook. f. The specific name *ovalifolia* (*Xanthochymus ovalifolius*, Roxb. 1832) has priority over *spicata* (*X. spicatus*, Wight & Arn. 1834) but it was first used in combination with *Garcinia* by Oliver in the Flora of Tropical Africa to designate a different species and is therefore not available for this one.

Calophyllum decipiens, Wight. This appears to be the earliest name which can be applied accurately to this *Calophyllum* and the fact that Thwaites afterwards applied it to another species, *i.e.*, to the tree subsequently called *C. Thwaitesii* (Planch. et Trian. Mem. Guttif. 232) does not invalidate its use for the one originally intended by Wight.

C. tomentosum, Wight. The type of this species is a Ceylon tree which has not been reported in the area covered by this Flora. The Travancore species is much less tomentose and should bear Beddome's name of *C. elatum* (Bedd. Fl. Sylv. t. 2).

DIPTEROCARPACEAE.—*Hopea Wightiana*, Wall. and *H. glabra*, Wight & Arn. published by the latter at the same time (Prodr. i. 85) appear both to belong to the same tree. Beddome placed them together but Dyer and Brandis separated them. Wight's figure (Ill. t. 37) showing a different leaf-nervation should probably not be cited here.

Balanocarpus utilis, Bedd. The pubescent petals of this species serve to distinguish it in the absence of fruit from the glabrous-petalled but otherwise closely similar *Hopea parviflora*, Bedd.

MALVACEAE.—*Malva parviflora*, Linn. The synonymy as regards S. Indian specimens has become much confused. Wight and Arnott (Prodr. 45) mention two varieties of *M. rotundifolia*; var. *a*, having petals many times longer than the calyx, is probably *M. sylvestris* and the citation of Heyne's Mysore plant doubtless refers to the specimens of that species now preserved

in the Kew Herbarium, collected there by him on April 16th, 1800; var. β founded on Wallich n. 1884 f. is *M. parviflora*, Linn., having glabrous petal-claws and interlocking carpel-teeth. As Wight and Arnott appear not to have appreciated the differences between these species the descriptions in the Prodromus should not be cited.

Sida veronicaefolia, Lam. The spelling *veronicifolia* is not that of Lamarck which is as above and although the Vienna Rules recommend the use of "i" in such cases the recommendation is only for future use and does not enjoin retrospective correction.

Sida Schimperiana, Hochst. *Melochia truncata*, Willd., both as described by Willdenow and as exemplified by a plant in the Kew Herbarium determined by him, is clearly referable to this species and if the binominal *Sida truncata* were not already preoccupied by a Brazilian plant this species would be correctly designated by that name. It has no claim to identification with the entirely different plant *Melochia corchorifolia*, Willd.

Abutilon polyandrum, Wight & Arn. Cooke points out (Fl. Bomb. i. 95) that the *A. polyandrum* of G. Don is a misprint for *A. polyanthum*, quite a different species originally named, by Schlechtendal, *Sida polyantha*. Wight and Arnott should therefore be cited as the authors of the first-mentioned binominal and not G. Don who published it earlier but by accident.

A. hirtum, G. Don founded upon Lamarck's *Sida hirta* (1785) has precedence of *A. graveolens*, Wight & Arn. founded upon Roxburgh's *Sida graveolens* (1805).

Abutilon glaucum Cav. Cavanilles's *Sida glauca*, upon which this is founded, has priority over *Sida mutica*, Delile, the prototype of G. Don's *Abutilon muticum*.

Decaschistia crotonifolia, Wight & Arn. Prodr. (1834) 52 is the first publication of this binominal and the reference to Wight's specimen No. 215 identifies it with the shrub with short white tomentum on the branches as distinct from Craib's *D. rufa* (*Kew Bull.* 1912, 35) which has rough reddish spreading hairs. It is important that the first named should not be confused with Wallich's *Hibiscus crotonifolius* (Wall. Herb. 1901 A) which is referable to Craib's species.

Hibiscus moschatus, Wight & Arn. being founded on Wight no. 203 (*H. Abelmoschus*, Linn.) and Wallich no. 2699 (*H. esculentus*, Linn.) must be omitted from synonymy as a mixture of two species.

Bombax scopulorum, *Dunn*. This tree is fully described in Bourdillon's Forest Trees of Travancore (p. 45) where it is doubtfully identified with Wallich's *B. insigne* and attributed to Malabar, Burmah, and the Andamans in addition to Travancore. Perhaps the distinctions between it and Prain's var. *Wightii* of *B. insigne*, Wall. were not observed by Bourdillon who confused it in consequence with that more widely distributed tree.

XII.—GARDEN NOTES ON NEW TREES AND SHRUBS.

W. J. Bean.

(With Plate.)

XIX.—*New Chinese and Japanese species.*

Celastrus flagellaris, *Ruprecht.* Celastraceae.

Although described by Ruprecht as long ago as 1857, this climber is a comparatively new plant in cultivation. It was obtained for Kew from a French nursery a few years ago and last year bore fruit freely. It is a deciduous climbing shrub found wild in Manchuria, Corea, Japan and N. China. The stems are slender, armed at each node with a pair of hooked spines about $\frac{1}{6}$ in. long, and are described as growing 25 ft. high. Leaves roundish to broadly oval, $\frac{3}{4}$ to $2\frac{1}{4}$ in. long, acute at the apex and cuneate at the base, bright green on both sides, finely toothed. Among cultivated species of *Celastrus* this is very distinct in the great proportionate length of the petiole which is as much as $1\frac{1}{4}$ in. long. The fruit is a three- sometimes four-celled capsule, globose when unripe, about $\frac{1}{4}$ in. in diameter, and terminated by the persistent style $\frac{1}{8}$ in. long. It is when it bursts that the shrub is most ornamental, the inner face of it is then shining yellow, whilst the aril, or coat of the seeds is scarlet.

The species is perfectly hardy and of vigorous habit.

Celastrus hypoleucus, *Warburg.* (*C. hypoglaucus*, Hemsley.) Celastraceae.

Originally introduced by Wilson for Messrs. Veitch during one of his early journeys in China and again in greater quantity during the later ones, this Celastrus is now probably fairly distributed over the country. According to the collector it is common in the mountains of north-west Hupeh, and he describes it as strikingly beautiful when laden with fruit in autumn. It is a vigorous deciduous climber with purplish, glabrous young shoots. The leaves are oblong, oval or obovate, 4 to 6 in. long, and 2 to 3 in. wide on our young plants; they are glabrous and dark green above, and usually very glaucous beneath. The flowers are in terminal racemes sometimes 8 in. long, small and yellowish-green. The fruits are globose and about the size of a large pea until they burst, when they show the yellow and orange of the inner surface of the capsule valves and the coat of the seed.

The species is apparently quite hardy and vigorous, although we have as yet no record of its having borne fruit in this country. It is distinct amongst the cultivated species of *Celastrus* in the combination of a long terminal inflorescence with glaucous leaves.

Cercis racemosa, *Oliver.* Leguminosae.

Discovered by Prof. A. Henry about 1886 and described and named by Prof. Oliver in *Hooker's Icon. Plant.* xix. t. 1894, this very distinct species of Judas tree was not introduced until some twenty years later, when Mr. Wilson sent home seeds collected by him in Western Hupeh. It is a deciduous shrub or small tree occasionally 30 ft. high, its young shoots thickly set with lenticels and more or less pubescent. The leaves have the characteristic Cercis form, being cordate, $2\frac{1}{2}$ to 5 in. long, three-fourths as wide; but from those of all other cultivated species, they differ in being pubescent beneath, especially on and near the chief veins. The most distinctive character of the species, however, is found in the racemose arrangement of the flowers, all the others having them in fascicles. The racemes are pendulous, $2\frac{1}{2}$ to 4 in. long, the rachis and pedicels very pubescent. Wilson describes the flowers as "silvery rose." We have not yet seen them in gardens, but judging by dried specimens the tree flowers very profusely and is, indeed, one of the most beautiful of Chinese trees. Seedling trees are in Mr. Vicary Gibbs' collection at Aldenham, and in that of Miss Willmott at Warley, and we have grafted ones at Kew. The other Chinese species, *C. chinensis,* Bunge, has been in cultivation for many years, but we have found it too tender to be a success. Wilson observes that it is always growing at lower altitudes than *C. racemosa,* which we have every reason to believe will prove quite hardy.

Disanthus cercidifolia, *Maximowicz.* Hamamelidaceae.

For several years past no tree or shrub at Kew has made a richer display with its autumnal colour of foliage than this. It is a deciduous shrub described as growing 8 to 10 ft. high with slender spreading branches, which, like the foliage, is perfectly glabrous. The leaves are very like those of the common Judas tree in shape, being broadly ovate to roundish, often cordate at the base, 2 to $4\frac{1}{2}$ in. long, almost as wide, three- or five-nerved. In summer they are deep green, but for a week or two before falling in autumn turn a beautiful claret colour suffused with orange. The plant was first introduced about twenty years ago, but is still very rare and does not appear to have flowered under cultivation in this country. It does not, however, seem to have much beauty of blossom. Two stalkless flowers, set back to back, are borne on axillary peduncles $\frac{1}{4}$ in. long. The petals are narrow, tapering, $\frac{1}{4}$ in. long, dark purple; calyx-lobes short and recurved, $\frac{1}{8}$ in. long; stamens five. Fruit a woody capsule containing several shining, dark brown compressed seeds, $\frac{1}{8}$ in. long.

This shrub is a native of Japan where it flowers in October. At Kew we have found it rather tender when young, but a plant now 6 ft. high growing in association with, and sheltered by, tall heaths has not suffered from cold since it was obtained ten years ago.

Magnolia officinalis, *Rehder & Wilson.* Magnoliaceae.

This Magnolia, at first considered to be the Chinese form of

M. hypoleuca, has lately (*Plantae Wilsonianae* i. p. 391) been made a species by Messrs. Rehder and Wilson. It was originally introduced by the latter to the Coombe Wood Nursery about the end of 1900. From Messrs. Veitch two plants were obtained for the Kew collection which are succeeding very well. Probably it is in other collections under the name of *M. hypoleuca*. The Veitchian "Wilson" number is 371.

M. officinalis is a deciduous tree 30 to 50 ft. high, its young shoots silky tomentose the first year, becoming glabrous the second and turning ultimately a yellowish grey colour. The leaves are of magnificent proportions, being sometimes as much as $1\frac{3}{4}$ ft. long and 9 in. wide. In outline they are obovate, the apex rounded, the base cuneate. The upper surface is glabrous, the lower one pubescent, glaucous, and minutely reticulate. The flower is solitary at the end of a leafy shoot, white, fragrant, 6 to 8 in. in diameter. Sepals and petals together are nine to twelve in number, fleshy. Stamens very numerous, their filaments red, making a beautiful and conspicuous centre to the flower. Fruits about 4 in. high, half as wide, slightly ovoid, flat at the top.

According to Wilson this Magnolia is cultivated in Western Hupeh and Szechuan, but, although he has no doubt it is a genuine native of those regions, he did not find it growing wild. So far as can be judged at present, the most perceptible distinction between our young trees and those of *M. hypoleuca* is in the colour of the young wood which, in the latter species, is purple. *M. hypoleuca* is also the bigger tree.

Meliosma Beaniana, *Rehder & Wilson.* Sabiaceae.

Previous to Wilson's journeys in Central and Western China, the genus *Meliosma* was represented in gardens by a single rather tender species, *M. myriantha*, Sieb. & Zucc., introduced from Japan by Maries about 1879. Four other species at least, all apparently quite hardy, are now in cultivation, thanks to Mr. Wilson's efforts. The genus *Meliosma* has two well-marked groups, those with simple leaves like *M. myriantha* and *M. cuneifolia*, and those with pinnate leaves. To the latter group *M. Beaniana* belongs.

It is a deciduous tree found by Wilson to range between 40 and 80 ft. in height. The leaves are composed of usually four and a half pairs of leaflets (sometimes six and a half pairs), which are oval or obovate, the lower ones the smallest and 1 to 2 in. long, the others increasing in size towards the end, where they are $2\frac{1}{2}$ to 5 in. long and 1 to $2\frac{1}{2}$ in. wide, smooth or nearly so above, with tufts of reddish brown tomentum in the vein-axils beneath. The flowers, for which we may have some years to wait, are creamy white and borne below, but with, the young leaves in spring. They are in panicles up to 8 in. long, and, as in all Meliosmas are small and about $\frac{1}{3}$ in. wide. Fruit black, globose, $\frac{1}{4}$ in. in diameter.

Mr. Wilson speaks highly of the beauty of this tree as seen by him wild in Hupeh and Szechuan. When in flower during

the month of May, the pendulous or spreading panicles are so clustered and so numerous on the tree that it is covered with blossom. It then makes a strikingly conspicuous object in the landscape and one of the handsomest of Chinese trees. The Kew plants were raised from seed gathered in 1907 and 1910. They are growing promisingly. The "Wilson" numbers of this tree are 154, 258, and 258A.

Prinsepia uniflora, *Batalin*. Rosaceae.

The genus *Prinsepia* has been known for some years past in shrub collections by *P. sinensis*, more commonly known as *Plagiospermum sinense*, Oliv. (see *Kew Bulletin*, 1909, p. 354). This year, until spoilt by the snow and frosts of early March, *P. sinensis* was flowering at Kew very prettily. Sir F. W. Moore also sent sprays thickly furnished with blossom from Glasnevin. A plant of *P. uniflora* has just been received from the Arnold Arboretum, where the species was raised in 1911 from seed collected by Purdom in Shensi, and where it has flowered and developed fruits. It is a deciduous shrub, its branches armed with slender, straight thorns $\frac{1}{4}$ to $\frac{1}{2}$ in. long. The leaves are dark glossy green, 1 to $2\frac{1}{4}$ in. long, $\frac{1}{4}$ to $\frac{1}{3}$ in. wide, the margins of the lower part very sparsely serrate. As in *P. sinensis* the flowers come from the axils of the clustered leaves on the year-old shoots, but they are very distinct from the bright yellow ones of that species in being white. Each flower is $\frac{3}{5}$ in. wide, borne on a glabrous peduncle $\frac{1}{6}$ in. long, the petals obovate, the calyx roundish, ciliate.

Closely allied to *P. sinensis*, this is distinguished, not only by the white flowers, but also by the shorter peduncles and narrower leaves distantly toothed towards the base.

Prunus Conradinae, *Koehne*. Rosaceae.

Among the numerous species of *Prunus* introduced from China by Wilson, this has been the first to establish its value as a flowering tree. During the last week of January, 1916, and the first week of February it was the most attractive tree or shrub in flower out-of-doors at Kew. And we heard from Mr. J. C. Williams that at Caerhays it was also very beautiful about the same time. It belongs to the *Cerasus* or cherry group of *Prunus* and is a deciduous tree reaching 35 to 40 ft. high in a wild state. As represented by small trees at Kew its branches are semi-pendulous and very graceful (see Plate III. facing p. 70). The oblong or obovate leaves are $2\frac{1}{2}$ to 6 in. long, serrate, narrowed abruptly at the apex to a short, acuminate point. The flowers are white, produced three to five together in very shortly-stalked umbels. Each flower is about $\frac{3}{4}$ in. in diameter, the narrowly obiong petals being deeply notched or jagged at the apex. Many of the stamens assume a petaloid character. The flowers are charmingly fragrant.

1. Flower showing bilobed petals and petaloid stamens; 2. detals; 3. petal with claw; 4–8. various petaloid stamens; 9. stamen.

P. Conradinae was raised from seed sent from the Arnold Arboretum late in 1907. It had been collected by Wilson the previous June in Western Hupeh at 3500 to 4000 ft. elevation. Of very early flowering trees, this promises to be the best of recent introduction.

Pterocarya hupehensis, *Skan.* Juglandaceae.

An addition to a group of trees of such distinction as the Wing-nuts is welcome. A few fine trees of *P. caucasica* are scattered over the country, but considering its adaptability for dampish places it has not been planted so generally as one might expect.

P. hupehensis, introduced from the province of Hupeh, China, to the Coombe Wood nursery by Wilson during one of his early journeys, is similar in many respects to the Caucasian tree. It is deciduous and grows upwards of 70 ft. in height. The young shoots are glabrous. On the type specimens collected by Henry (No. 6158) now preserved in the Kew Herbarium, and the only one there, the leaflets number five to nine on each leaf, but on a young tree growing at Kew there are sometimes as many as twenty-three. Each leaflet is oval-lanceolate, obliquely rounded at the base, acuminate, finely serrate, and the largest are 4 to

PLATE III.

PRUNUS CONRADINAE.

[*To face page 70*

PLATE IV.

POLYPORUS SHOREAE.

5 in. long by $1\frac{1}{4}$ to 2 in. wide. There are tufts of brown pubescence in the vein axils beneath, but these are not so conspicuous as in *P. caucasica*. The fruits, borne on pendulous spikes up to 20 in. long, consist of a small nut supporting a wing on each side, the wing roundish and $\frac{1}{2}$ in. long.

The species appears to be very hardy, and planted on the damp situation south of the Lily house (No. XV.), is thriving well.

Stewartia sinensis, *Rehder & Wilson*. Ternstroemiaceae.

Mr. E. H. Wilson introduced this shrub or small tree to the Coombe Wood nursery during one of his earlier Chinese journeys. Being at first regarded as a form of the Japanese *S. monadelpha*, Sieb. & Zucc., it was distributed by Messrs. Veitch under that name, and as *S. monadelpha* no doubt exists in several gardens. A study of full material has led Messrs. Rehder and Wilson to treat it as a new species.

It is described as being occasionally 30 ft. high. Our young plants have the shoots at first thickly covered with fine, outstanding hairs. Leaves deciduous, narrowly oval, tapered at both ends, remotely serrate, furnished above with numerous silky hairs at first and with similar hairs beneath but chiefly on the midrib; they are $2\frac{1}{2}$ to 4 in. long, 1 to $1\frac{1}{2}$ in wide, the petiole hairy, $\frac{1}{6}$ in. long. Judging by the author's description, some forms are glabrous or nearly so. Flowers white, solitary in the leaf-axils, about $1\frac{1}{2}$ wide, the petals silky on the outside. Stamens numerous, with downy filaments. Styles united into one column, five-rayed at the top.

This shrub appears to be quite hardy at Kew and thrives well in a peaty soil such as suits heaths. It is quite easily propagated by cuttings. From the true *S. monadelpha*, perhaps not in cultivation, it is distinguished by its larger, more distinctly five-angled capsules which are twice as wide as those of *S. monadelpha*.

XIII.—FUNGI EXOTICI : XX.

(With Plate.)

Polyporus pyrophilus, *Wakefield*.

Pileus 6–8·5 cm. diametro, crassus, rugulosus, azonatus, minute velutinus, rhabarbarinus vel pallide cinnamomeus. *Contextus* rhabarbarinus. *Stipes* crassus, 3–6·5 cm. longus, nunc cylindricus, basi subbulbosus, 1·5 cm. diametro, nunc deorsum incrassatus, 3–4 cm. diametro, plus minusve rugulosus, velutinus, pileo concolor. *Pori* minuti, concolores, vix decurrentes. *Sporae* ellipticae, fere hyalinae, 5-6 × 3 μ.

Tropical Africa. Nigeria: Southern Provinces; on burnt ground, *Farquharson* 50, May, 1914. Sierra Leone: amongst ashes, *N. W. Thomas*, 1914.

A large robust species. The Nigerian specimens have very thick stems and resemble in habit *P. orientalis*, Lloyd, but differ in the absence of setae in the hymenium. The Sierra Leone specimens are more slender and regular in form, but the

species appears to be characterised by the large size, short thick stem, and almost hyaline spores.

Polyporus Shoreae, *Wakefield.*

Pileus horizontalis, applanatus, sessilis vel substipitatus, 18–27 cm. latus × 15 cm. longus × 1–2 cm. crassus (in sicco), siccitate recurvus, margine pallidiore obtuso. *Cutis* tenuis, fusco-badia vel nigrescens, primo rubiginoso-pruinata, vix zonata, demum glabra, rigida, rimosa. *Contextus* ad 1·5 cm. crassus, fibrosus, induratus, subzonatus, ferrugineo-fulvus. *Tubuli* ad 3 mm. longi, intus glaucescentes, rigidi. *Pori* minuti, subangulati, dissepimentis tenuibus rigidissimis, primo glaucescentes, demum ferrugineo-umbrini. *Setae* nullae. *Sporae* hyalinae, subglobosae, 3–3·5 × 2·5–3 μ.

India. Bengal: Angul Division, *McCrie*, 1910; Buxa Division, *Hole*, 1915; *Shaw*, 1915; Jalpaiguri Division, *Hole*, 1915; on trunks of *Shorea robusta*, near the ground.

The plate (facing p. 71), shows a mature sporophore at the base of the trunk of a large tree of *Shorea robusta*.

The fungus is suspected of being the cause of a serious disease of Sal. The wood beneath the seat of the sporophores invariably shows the condition known as "partridge wood," the effect being similar to that of *Trametes Pini*, but more marked.

The species appears to be quite distinct from any previously described. When dry it is readily recognised by the hard but very brittle texture, especially of the pores, and the wrinkled and deeply cracked, dark crust. Photographs of living specimens show the margin of the pileus to be pale (whitish?), soft and swollen when fresh, but in dried material it is much shrunken and discoloured. It would also appear to exude drops of water, like that of *Polyporus dryadeus*. The flesh resembles in texture that of *P. dryadeus*, but in colour is more yellow, between Ridgway's "Antique brown" and "Ochraceous tawny."

Polystictus violaceus, *Wakefield.*

Pilei imbricati, sessiles, 5–6 cm. lati, 5 cm. longi, subinde ad 14 cm. lateraliter confluentes, tenues, in sicco rigidi, azonati, leniter rugulosi, minute velutini, violaceo-cervini. *Contextus* violaceus tenuis; tubuli concolores, 2 mm. longi, rigidi. *Pori* minuti, irregulares, angulati dissepimentis tenuibus, violascentes, marginem versus pallide cervini. *Sporae* non visae. *Hyphae* pallide lilacino-fulvae, 3·5–4 μ diametro.

Tropical Africa. Uganda: Namutambula Forest; on a decayed stump, Jan. 1915, *Maitland* 103.

In coloration this species closely resembles *Trametes violacea*, Lloyd, but cannot be regarded as a form. It differs entirely in habit; moreover, the hyphae of the pore walls in this species are pale, similar to those of the flesh, whereas in *T. violacea* they are dark purplish brown.

The colour of the pileus exactly matches Ridgway's "Fawn," with here and there a warm violet tinge.

Caldesiella Duemmeri, *Wakefield.*

Fungus late effusus, tenuissimus, tomentosus, fusco-ferruginosus, margina indeterminato concolore. *Aculei* minuti, nudo oculo vix conspicui, conici, acuti, vel subgranuliformes, haud conferti. *Cystidia* nulla. *Sporae* copiosae, ferruginosae, punctato-scabrosae, globosae, 4 μ diametro. *Hyphae* laxe intertextae, septato-nodosae, 2·5 × 3 μ (basales ad 5 μ) diametro.

Tropical Africa. Uganda: Kipayo; on a rotten log in forest, May, 1914, *Dümmer* 635.

Distinguished from known species of *Caldesiella* by the very small spores. The general colour of the hymènium matches Ridgway's "Raw Umber" (17 m).

Hymenochaete tristicula (*Berk. & Br.*) *Mass.* in Journ. Linn. Soc. xxvii. 1890, p. 111.

Corticium tristiculum, Berk. et Br. in Journ. Linn. Soc. xiv. 1873, p. 71.

H. castanea, Wakefield in Kew Bull. 1914, p. 260.

Duportella velutina, Pat. in Phil. Journ. Sci. x. 1915, p. 87 (?).

The receipt from Uganda of material of this species in an older stage has led to the establishment of the above synonymy. The Nigerian collection No. 5, on palm leaves, on which *H. castanea* was founded, is in a young state, and more brightly coloured than usual. Unless it be subsequently found that there is a spore-difference, however, it is not possible to maintain it as a distinct species. In the older material, the mature basidia project above the brown setae, forming a compact, waxy hymenium, which is cracked into small areas when dry. In this stage the hymenium is greyish or even pallid, and the chestnut colour given by the setae is visible only in the marginal parts of the fungus. Abundant spores are present in these old specimens. They are hyaline, cylindric-ellipsoid, slightly curved, 8–11 × 3–4 μ.

The genus *Duportella* was recently established for fungi having the peculiar structure of this species. From the description it seems probable that *D. velutina* is identical with the present plant. *D. Raimundoi* is said to be more brightly coloured, but as spores were not found it is possible that this is again a question of age, as in the case of *H. castanea*. *Duportella* is related to *Hymenochaete* in the same way of *Gloeocystidium* to *Corticium*. In neither case does the presence of "gloeocystidia" appear to be sufficient to warrant a generic distinction. The present plant is peculiar in the eventual development of the hymenium above the setae, but it seems preferable on the whole to retain it in *Hymenochaete*.

Geaster pulverulentum, *Wakefield.*

Exoperidum fere ad basim in segmenta 6–7 partitum, 4–5·5 cm. diametro; segmenta patentia vel revoluta, strato externo albido, floccoso, mox secedente, e rhizomorphis albidis oriundo, strato interno carnoso, griseo, siccitate rimoso. *Endoperidium* subglobosum, substipitatum, umbrinum, griseo-pruinosum. *Peristomium* vix prominens, obscurius, sericeo-

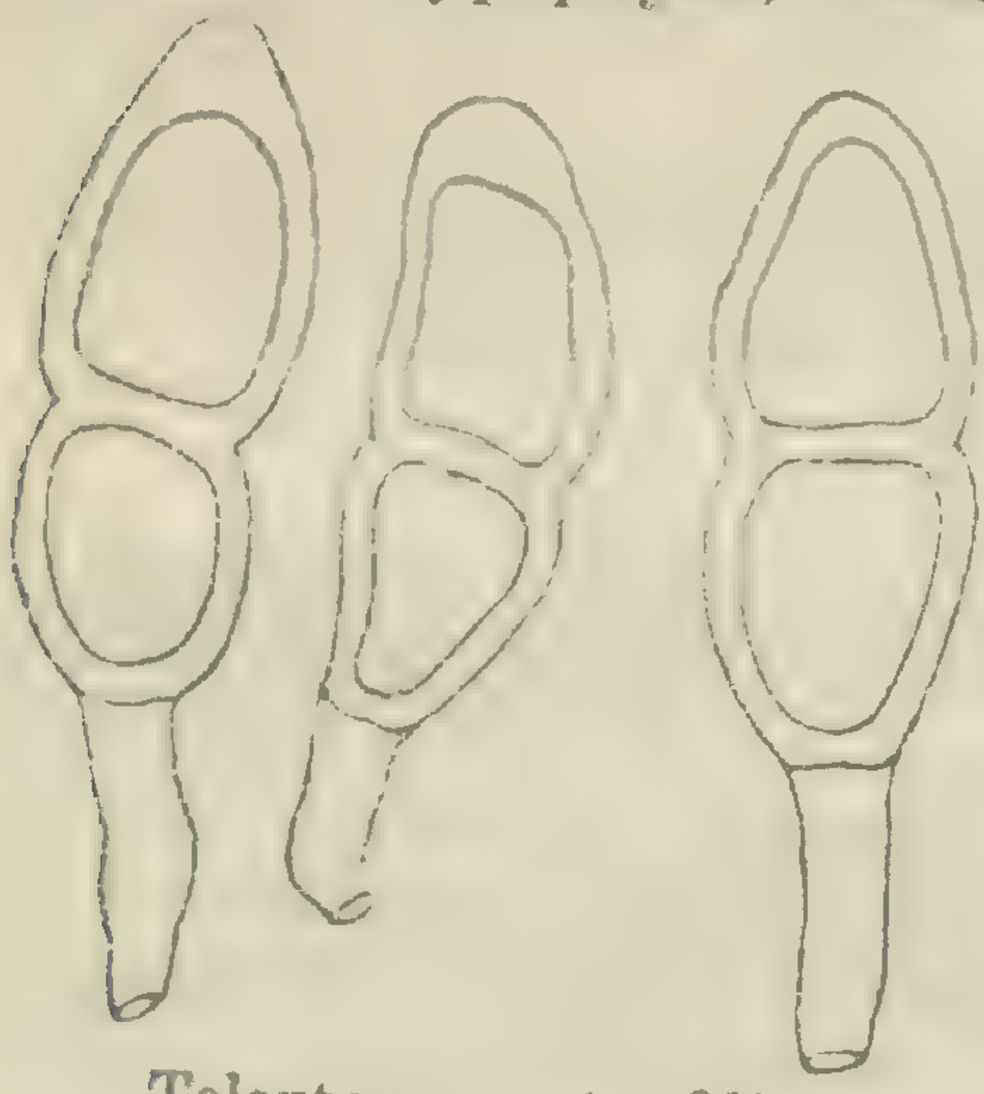
striatum, non sulcatum. *Hyphae* capillitii olivaceo-brunneae, crasse tunicatae, ad 6 μ latae, laeves vel granulis minutis incrustatae. *Sporae* fusco-brunneae, laeves, 3–3·5 μ diametro.

Tropical Africa. Nigeria: Southern Provinces; on the ground, July, 1914, *Farquharson* 58.

The species differs from *G. saccatus* in the slightly stalked endoperidium and spreading, not saccate, exoperidium; from *G. minimus* in the larger size; and from *G. Schmidelii* in the absence of the sulcate mouth.

Puccinia Pentadis-carneae, *Wakefield.*

Sori teleutosporiferi punctiformes, pulvinati, cinnamomeo-brunnei, hypophylli, maculis minutis brunneis insidentes. *Teleutosporae* laeves, oblongae, sursum leniter attenuatae vel rotundatae, apice non vel ad 6 μ incrassato, medio valde constrictae, flavidae, 30–40 × 13–15 μ; pedicelli hyalini, 4–7 μ crassi, ad 25 μ longi.



Teleutospores (× 825).

Tropical Africa. Uganda: Kipayo; grassland, on leaves of *Pentas carnea*, Oct., 1914, *Dümmer* 1123.

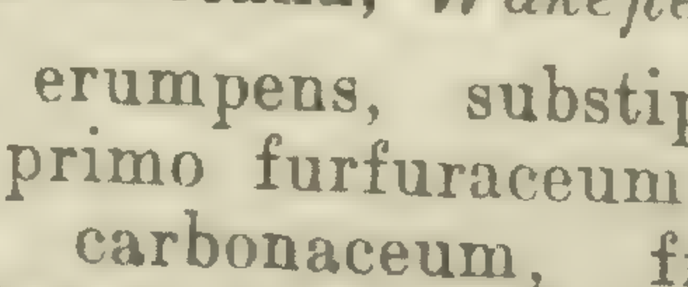
Distinct from *P. Pentadis*, P. Henn. in the smooth teleutospores. These germinate in situ.

Camillea africana, *Wakefield.*

Stroma erumpens, substipitatum; capitulum ad 4 mm. diametro, primo furfuraceum, purpureo-fuscum, demum laeve, subnitens, carbonaceum, fragillimum. *Perithecia* erecta, oblonga, immersa, collis destitutis, ostiolis non prominulis, inconspicuis. *Asci* mox diffluentes. *Sporae* fuscae, inaequilaterales, curvulae, ellipticae vel cylindraceae, 9–10 × 4–5 (–6) μ.

Tropical Africa. Uganda: Mount Elgon; on dead wood, Small 137.

The species somewhat resembles in habit *C. surinamensis*, B. & C., but is larger, and has smaller spores.



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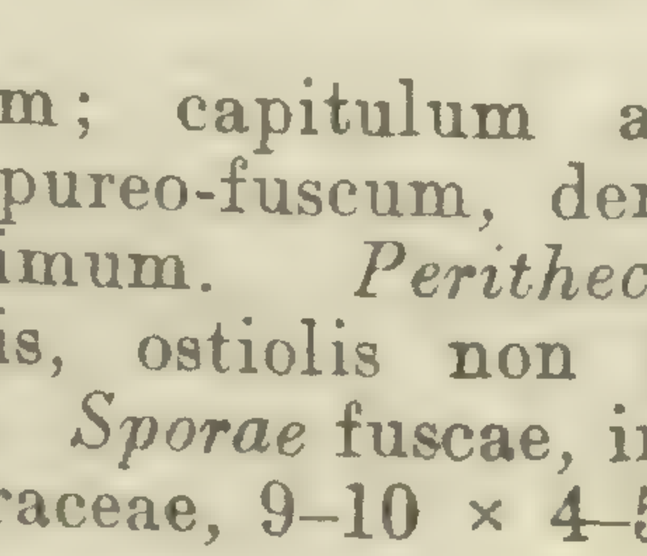

b

a. Habit (nat. size). *b.* Spores (× 825).

Cordyceps peltata, *Wakefield.*

Stroma stipitatum, stipite ligno omnino immerso, capitulo supra corticem emergente. *Capitulum* peltatum, pulvinatum,

primo pallidum deinde rufo-brunneum, margine pallidiore, 1–2 processibus sterilibus conicis ad 1 mm. longis praeditum, ostiolis obscurioribus vix vel leniter prominulis punctatum, 2–5 mm. vel e fusione 5–7 × 3–4 mm. *Stipes* brevis, pallidus, e mycelio larvam obtegente et destruende oriundus. *Perithecia* immersa, circa 0·25 **mm. longa**. Asci clavati, longe stipitati, pars sporifera 100 × 10 μ. *Sporae* hyalinae, fusiformes, utrinque acutae, multiseptatae, 72–91 × 3–3·5 μ, saepe medio geniculatae, maturitate in duobus articulis secedentes.

a. Habit of fungus (nat. size). *b*. A single head (× 4). *c*. Ascus (× 825). *d*. Spore as seen in water (× 825). *e*. Spores stained with iodine to show outer wall (× 825).

WEST INDIES. St. Vincent; parasitic on larvae of *Cryptorhynchus* sp., infesting cultivated *Codiaeum*, *W. N. Sands*. Sent by the Mycologist under the number V. 25–6–15.

The species is very distinct from other known species of *Cordyceps* not only in the peculiar habit but also in the large spores which instead of breaking apart at every septum at maturity separate only across the middle into two narrowly wedge-shaped halves. Each spore is surrounded by a very delicate hyaline outer wall, which can be only faintly distinguished even when treated with iodine. The peltate heads on the surface of the bark have superficially the appearance of a species of Hypocrea, but when the bark is dissected away the stalks are seen arising from a felt-like, whitish mycelium which completely envelopes the dead larvae lying in their burrows Several stromata may arise from one larva, and the heads occasionally become confluent.

Beniowskia Penniseti, *Wakefield*.

Maculae minutae, pallidae, vix distinctae. *Sporodochia* hypophylla, erumpentia, laxa, mollissima, sparsa vel gregaria, albida

vel pallidissima rosea, 0·5–1 mm. diametro. *Hyphae* 4–5 μ diametro, hyalinae, septatae, reticulato-anastomosantes, masculis polygonalibus 30–85 μ diametro. *Conidia* lateralia, e denticulis oriunda, globosa, laevia, hyalina, 10 μ diametro.

Tropical Africa. Uganda: Kampala; leaves of *Pennisetum purpureum*, Schum., *Small* 251. Said to occur also on *Sorghum vulgare*.

a. Habit (nat. size). *b*. Portion of tuft showing anastomosing conidia-bearing hyphæ (× 825). *c*. Conidia (× 825). Two show budding.

The peculiar reticulate arrangement of the conidiophores and the laterally placed conidia seem to place the fungus in the genus *Beniowskia*, Rac. The species differs from *B. graminis*, Rac., however, in the absence of unbranched, spirally coiled, projecting hyphae; hence, if the reference of the present species is correct, this character is only specific and not diagnostic of the genus.

The conidia-bearing hyphae arise from a dense mass of mycelium within the tissues of the leaf, and are at first simple, erect, and closely packed together. On reaching the surface of the leaf they become branched and united into a network, forming small cottony tufts. The conidia are borne on small tooth-like projections occurring irregularly along the length of the hyphae. Occasionally free conidia are seen united in pairs, or more rarely three in a group, suggesting that the formation of secondary condia by budding has taken place.

E. M. Wakefield.

Puccinia pulvinata, *Massee* in *Kew Bull.* 1911, p. 224.

This name being antedated by *P. pulvinata*, Rabenh. in Hedwigia, 1871, p. 20 (Sydow, Monogr. Ured. i., p. 76), it is necessary to change it. It occurs on the same leaves of *Osyridocarpus natalensis*, DC. as *Aecidium Osyridocarpi*, Mass. and although there is no evidence that the two are connected, there can be no objection to naming it *P. Osyridocarpi*, Grove; in that case, if a connection is demonstrated later, unnecessary multiplication of names will be avoided.

In the same sori as the teleutospores and intermingled with them are comparatively few uredospores, oval, pallid honey-colour, slightly paler than the teleutospores, rather thick-walled, about 28 × 25 μ, densely and minutely warted. There is an

error in the original description in the measurements given for the teleutospores; instead of measuring 50 × 35 μ, the size varies from 25–38 μ × 19–23 μ. The sori present a very close resemblance in shape and colour to those of *Puccinia Malvacearum*, Mont.

W. B. Grove.

XIV.—NEW ORCHIDS: DECADE 44.

431. **Pleurothallis papillifera**, *Rolfe;* a *P. pachyglossa*, Lindl., petalis labello aequilongis, extus et margine papillis purpureis instructis differt.

Herba epiphytica. *Caules* aggregati, graciles, 3–5 cm. longi, vaginis tubulosis obtecti. *Folia* oblonga vel elliptico-oblonga, minutissime tridenticulata, coriacea, 4–7 cm. longa, 1·3–1·9 cm. lata. *Scapi* graciles, erecti, 12–15 cm. longi, vaginis paucis obtecti; racemi flexuosi, multiflori. *Bracteae* tubulosae, apice dilatatae, obtusae, 3–4 mm. longae. *Pedicelli* graciles, arcuati, circiter 1 cm. longi. *Flores* mediocres. *Sepalum* posticum lanceolatum, acutum, profunde concavum, 1·2 cm. longum; sepala lateralia connata, oblongo-lanceolata, obtusa, profunde concava, 1·1 cm. longa. *Petala* oblonga vel subspathulata, obcordata vel truncata, intus subconcava, extus et margine papillis numerosis instructa. *Labellum* pandurato-oblongum, acutum, carnosum, scabridum, subconcavum, 6 mm. longum; lobi laterales rotundati, erecti, submembranacei. *Columna* clavata, 2 mm. longa.

Costa Rica. *C. H. Lankester.*

Sent to Kew by Mr. C. H. Lankester, and flowered in the collection in November, 1915. The sepals are light green. and the petals semi-transparent white, with numerous dark purple papillae on the nerves and margin outside.

432. **Kraenzlinella rufescens**, *Rolfe;* affinis *K. Tunguraguae*, O. Kuntze, sed planta multo minore facile distinguenda.

Folia breviter petiolata, oblonga, subobtusa, coriacea, circiter 8 cm. longa, 2 cm. lata; petiolus 1 cm. longus. *Scapi* erecti, 15–18 cm. longi. subteretes, vaginis tubulosis paucis apice conduplicatis obtecti; racemi multiflori. *Bracteae* conduplicatae, lanceolatae, acuminatae, carinatae, 1·2–1·3 cm. longae. *Pedicelli* 5–6 cm. longi, ovarium muricatum. *Flores* mediocres. *Sepala* subconniventia, posticum elliptico-lanceolatum, acutum, concavum, 1·5 cm. longum; lateralia lanceolata, acuta, concava, carinata, 1·7 cm. longa; basi breviter connata. *Petala* erecta, lineari-lanceolata, acuta, 7 mm. longa, basi columnae adnata et breviter auriculata. *Labellum* recurvum, oblongum, subobtusum, 8 mm. longum, facie nitidum et glutinosum, basi auriculato-sagittatum et breviter sigmoideo-unguiculatum. *Columna* arcuata, subclavata, acutangula, 8 mm. longa, pede 3 mm. longo.

Peru. *L. Forget.*

Flowered with Messrs. Sander & Sons, St. Albans, in October, 1915. The flowers are tawny-yellow, more or less dotted with brown on the lateral sepals, and obscurely lined on the dorsal, with the front of the lip green, and two dusky lines extending down the sides to the slightly-auricled base. The locality is not quite certain, but it is believed to be one of M. L. Forget's Peruvian introductions.

433. **Eulophia Stewartiae,** *Rolfe;* ab *E. subintegra,* Rolfe, floribus majoribus, sepalis petalisque duplo latioribus valde differt.

Folia elliptico-lanceolata, acuta, 3–5-nervia, 30 cm. longa vel ultra, 5 cm. lata. *Scapi* crassiusculi, vaginis spathaceis subimbricatis obtectis. *Racemi* 7–12 cm. longi, multiflori. *Bracteae* elliptico-lanceolatae, acuminatae, 2·5–3 cm. longae. *Pedicelli* crassiusculi, circiter 2 cm. longi. *Sepala* elliptico-lanceolata, acuta vel subacuminata, 3 cm. longa. *Petala* ovato-elliptica, subobtusa, 3 cm. longa, 2 cm. lata. *Labellum* subintegrum, ovatum, subacutum, fere 2 cm. longum, medio graciliter carinatum, supra basin cristam 4-lobam instructa; discus laevis; calcar clavatum, incurvum, 5 mm. longum. *Columna* 5 mm. longa.

S. Africa. Swaziland, at Hlalikulu, on marshy ground, *Miss M. M. Stewart* 41.

Flowers cream-coloured, with deep brown centre.

434. **Sigmatostalix costaricensis,** *Rolfe; S. Eliae,* Rolfe, affinis sepalis petalisque longioribus, et labello sagittato-cordato differt.

Pseudobulbi approximati, ovato-oblongi, compressi, acutanguli, 2–2·5 cm. longi, apice monophylli, basi 2–3-phylli. *Folia* oblongo-lanceolata, subacuta, 5–12 cm. longa, 1·2–1·6 cm. lata. *Scapi* graciles, 15–20 cm. longi, multiflori. *Bracteae* ovato-lanceolatae, acutae, 3 mm. longae. *Pedicelli* 4 mm. longi. *Flores* parvi. *Sepala* et petala reflexa, lanceolata, acuta, 8–9 mm. longa. *Labellum* patens, unguiculatum, sagittato-ovatum, subconvexum, minute apiculatum, 6 mm. longum, 5 mm. latum; lobi laterales recurvi, 1 mm. longi; unguis 2 mm. longus; crista suberecta, dentiformis, subobtusa. *Columna* arcuata, 6 mm. longa, basi gracilis; alae subobsoletae.

Costa Rica. *C. H. Lankester.*

Presented to Kew by Mr. C. H. Lankester, and flowered in the collection in October, 1915. The sepals and petals are greenish-yellow, with a large brown blotch about the centre, and the lip red-brown, with a deep yellow apex and margin.

435. **Gomphicis Traceyae,** *Rolfe;* a *G. alba,* Lehm. et Kränzl., planta fere duplo minoribus, foliis parvis et floribus multo majoribus differt.

Folia rosulata, lanceolata vel lineari-oblonga, subobtusa, 3–5 cm. longa, 0·8–1·5 cm. lata. *Scapus* 25–50 cm. altus, puberulus, vaginis 5–7 lanceolatis vestitus; racemus 4–6 cm. longus, densiflorus. *Bracteae* ovatae, acutae, puberulae, 0·6–1 cm. longae. *Pedicelli* villosi, 5 mm. longi. *Flores* parvi, albo-

virescentes. *Sepala* 4–4·5 cm. longa, extus villosa; posticum elliptico-oblongum, obtusum, concavum; lateralia late oblonga, obtusa. *Petala* oblonga, subobtusa, 4 cm. longa, extus villosa. *Labellum* subtrilobum, conduplicato-plicatum, 4 cm. longum; lobi laterales oblongi, subobtusi, membranacei; lobus intermedius brevis, subtruncatus, cum disco incrassatus. *Columna* clavata, 3 mm. longa. *Gomphicis alba*, Lehm. & Kränzl. in Engl. Jahrb. xxvi. p. 500, ex parte.

Colombia. Paramo de Guanacas, near Popayan, 3000 m. *F. C. Lehmann* 6034. High Paramo near Bogota, 2450 m. *Mrs. J. A. Tracey* 107.

Two distinct species have been included under *Gomphicis alba*, Lehm. & Kränzl., and it is a little difficult to say as to which the description best applies. The stature and size of the leaves, however, agree with Lehmann's no. 7112, from the Western Andes of Cali, in the State of Cauca, at 1700-2000 m., and the name is therefore limited to it, while the other, which has much smaller leaves, and is identical with the plant collected by Mrs. Tracey, is called *Gomphicis Traceyae*.

436. **Chloraea robusta,** *Rolfe;* affinis *C. viridiflorae*, Poepp., sed floribus majoribus, labello subtrilobo, ovato-oblongo, et cristis densis et crassioribus differt.

Herba 30–35 cm. alta, robusta. *Folia* lanceolato-oblonga, acuta, 5–10 cm. longa, 0·6–2·5 cm. lata, supra in bracteam acuminatam gradatim decrescentia. *Racemus* 7–12 cm. longus, 3–8-florus. *Bracteae* oblongo-lanceolatae, acuminatae, 3–4 cm. longae. *Pedicelli* 1·2–1·8 cm. longi. *Sepala* oblongo-lanceolata, 2·5–3 cm. longa; posticum acuminatum; lateralia obtusa et incrassata. *Petala* ovato-oblonga, acuta, 2–2·4 cm. longa. *Labellum* subtrilobo-integrum, ovato-oblongum, obtusum, 1·8 cm. longum, 6–8 cm. latum, margine crenulatum v. dentatum, facie fere omnino verrucosum. *Columna* clavata, 1·6 cm. longa.

Chile. Sandy ridge above Baños de Chillan, 2300–2500 m., *H. J. Elwes.*

Allied to *C. viridiflora*, Poepp., but the lip is obscurely trilobed, and has more numerous, stouter crests than in Poeppig's figure, and in a single specimen at Kew that apparently belongs to it. Mr. Elwes remarks that it is very similar in colour and habit to *Chloraea grandiflora* and *C. Elwesii*.

437. **Chloraea densiflora,** *Rolfe;* affinis *C. cylindrostachyae*, Poepp., sed floribus minoribus, et labello anguste oblongo nec pandurato differt.

Folia caulina late oblonga, subacuta, supra in bracteam acuminatam gradatim decrescentia. *Scapus* 50–60 cm. altus; racemus densus, multiflorus, 10–15 cm. longus. *Bracteae* linear-lanceolatae, acuminatae, 2–3·5 cm. longae. *Pedicelli* 1·2–1·6 cm. longi. *Sepalum* posticum lanceolato-oblongum, incurvum, conduplicato-concavum, subacutum, 1·2 cm. longum; sepala lateralia linearia, subacuta, subfalcata, 1·2–1·4 cm. longa. *Petala* subspathulato-linearia, subfalcata, 1·2–1·4 cm. longa. *Labellum* integrum, anguste oblongum, obtusum, crenulatum, prope apicem

valde undulatum, 1–1·2 cm. longum; facie fere omnino dense papillosum. *Columna* clavata, 8 mm. longa.

Chile. *Lake Quillen*, about 1200 m. *H. J. Elwes.*

"A tall green-flowered species." Radical leaves not seen. It has the general habit and appearance of *C. cylindrostachya*, Poepp., but the flowers are much smaller, and the lip scarcely half as broad and different in shape, while the other segments are also considerably narrower.

438. **Chloraea Elwesii,** *Rolfe;* affinis *C. magellanicae*, Hook. f., floribus majoribus, labello late ovato et lamellis crassioribus differt.

Folia elliptico-oblonga, subobtusa vel apiculata, 7–10 cm. longa, 2·5–3·5 cm. lata, supra in bracteam acuminatam decrescentia. *Scapus* circiter 30 cm. altus; racemus 2–4-florus. *Bracteae* oblongo-lanceolatae, acuminatae, 3–4 cm. longae. *Pedicelli* 1·2–1·6 cm. longi. *Sepala* ovato-lanceolata, subobtusa, 2·5–3 cm. longa, 1–1·2 cm. lata, reticulato-venosa. *Petala* elliptica, 2–2·2 cm. longa, 1·2–1·4 cm. lata, reticulato-venosa. *Labellum* integrum, ovatum, obtusum, 1·4 cm. longum, circiter 1 cm. latum, prope apicem crenulatum vel papilloso-fimbriatum, facie fere omnino valde papillosum. *Columna* clavata, 1·6 cm. longa.

Chile. Lolco Pass, 1400 m., in large tufts under Araucarias. Lolco to Lonquimay, 1400 m., common at timber line. "Flowers handsome, green with black veins," *H. J. Elwes.*

Nearly allied to the Patagonian *C. magellanica*, Hook. f., and evidently its geographical representative, but the flowers are rather larger, the lip more broadly ovate, and the tubercles of the lip considerably stouter.

439. **Chloraea lotensis,** *Rolfe;* a *C. virescente*, Lindl., floribus minoribus, et labelli cristis multo minoribus differt.

Herba circiter 30 cm. alta. *Folia* radicalia marcida, caulina in bracteam acuminatam reducta. *Racemus* 7·5 cm. longus, circiter 12-florus. *Bracteae* lanceolatae, acuminatae, 1·8–2·5 cm. longae. *Sepala* oblongo-lanceolata, subobtusa, circiter 1·8 cm. longa; lateralia apice paulo incrassata. *Petala* elliptica, obtusa, 1·6 cm. longa, venis a basi ad medium varicosis. *Labellum* trilobum, 1·2–1·4 cm. longum, 1·2–1·4 cm. latum; lobi laterales oblongi, obtusi; lobus intermedius obovatus, disci venis fimbriato-ornatis. *Columna* clavata, 1 cm. longa.

Chile. Dry hills above Lota, 180 m., *H. J. Elwes.*

Allied to *C. virescens*, Lindl., but with smaller flowers and the crests of the lip much smaller.

440. **Asarca tenuiflora,** *Rolfe;* ab *A. thermarum*, Phil., floribus minoribus, et labelli hypochilio bilamellato lamellis papillis clavatis instructis differt.

Herba circa 60 cm. alta. *Folia* oblonga vel elliptico-oblonga, subobtusa vel apiculata, 5–13 cm. longa, 2·5–4 cm. lata, supra in bracteam acuminatam subito decrescentia. *Racemus* 1 cm. longus, multiflorus. *Bracteae* lanceolatae, acuminatae, 2–3 cm. longae. *Sepala* lineari-lanceolata, acuminata, 1·2–1·4 cm.

longa; lateralia prope apicem paullo incrassata. *Petala* subovato-lanceolata, acuminata, 0·8 cm. lata. *Labellum* trilobum, 4–5 mm. longum; hypochilium late quadratum, circiter 3 mm. latum, 2–lamellatum, lamellis papillis clavatis instructis; epichilium elliptico-lanceolatum, obtusum, omnino papillis clavatis instructum. *Columna* lata, 3 mm. longa.

Chile. Between Lolco and Lonquimay, in Araucaria forest, 1200–1400 m., *H. J. Elwes*. A single plant only found.

Allied to *A. thermarum*, Phil., but with smaller flowers, and the details of the lip different.

XV.—MISCELLANEOUS NOTES.

The Storm of Tuesday, March 28th, 1916.—During the last few years Kew has suffered somewhat severely in the loss of trees by storm. This has not been so much in the number of trees destroyed as in the individual interest of the trees themselves. The storm of March 28th will long be remembered for the damage done in the London district. In Kensington Gardens alone ninety-seven trees were uprooted. At Kew the damage was nothing like so extensive, and about twenty-five trees only—big and little—were blown down, but amongst them are several whose loss is greatly to be deplored.

First in importance was the fine cedar of Lebanon, second largest in Kew, which for more than 150 years grew close to the Temple of the Sun. It was one of a large number of trees transferred in 1762 to the then newly-founded Botanic Garden of Kew, by Archibald Duke of Argyll, from his famous collection at Whitton, near Hounslow. Three others of the same sending still remain, the Robinia, Turkey oak, and the persimmon. Its dimensions, taken from the fallen tree, were: height, 76 ft.; girth, 13 ft. 6 in. The tree was evidently sound and in good health. Many cedars in the country are considerably larger, but this tree was a notable one for the London district. So long as the consumption of coal in the metropolis is carried on in the present wasteful and dirty way it is not likely that trees so fine as the one we have lost will ever be built up there again.

In falling, the cedar crashed into the Temple of the Sun, swept it off its pedestal, and reduced it to a shapeless mass of timbers, laths and plaster. Built by Sir William Chambers in 1761 and probably completed about the time the cedar was planted, the two together have for many decades made one of the most attractive pictures in the landscape of Kew. Their conjunction has always been greatly admired—the white curving lines of the temple and the dark, horizontal limbs of the cedar enhancing each other's effectiveness. They have been depicted more than once by scene-painters on the London stage. It is a melancholy coincidence that, contemporaneous at the beginning and after 150 years' association, they shared a common doom.

Close by, another much smaller but also historical tree was destroyed. This was a specimen of the Minorca box (*Buxus*

balearica), a tree found wild in the Balearic Islands and the South-West of Spain. In 1837, Loudon mentioned it as being the largest tree of its kind within ten miles of London, and described it as 13 ft. high. The tree, which, according to Aiton, was introduced in 1780, grows extremely slowly. Nearly eighty years after its measurement by Loudon, it was only 25 ft. high, its trunk 2 ft. 7 in. in girth. Yet it was in perfect health and probably the finest of its kind in the British Isles.

A third tree of particular interest to British botanists, lost in the same hurricane, was a bay willow (*Salix pentandra*), which grew on the lawn due west of the Water Lily House (No. XV.). It was 50 ft. high, its trunk 7 ft. 9 in. in circumference—unusually large dimensions for this willow, which is one of the most distinct and handsome of British species. Its fragrant leaves, dark and lustrous, are more like those of bay laurel than the long, narrow, grey ones of typical willow.

The last of the famous group of elms known as the "Seven Sisters" came down, but it must in any case have been removed in a few years' time. These elms deteriorated very rapidly in recent years. As lately as 1883 the whole seven were in good health, and only two of them had broken tops, as may be seen in a fine drawing by Fitch in *Gardeners' Chronicle*, Sept. 15, 1883. There is an old eighteenth-century engraving in No. III. Museum in which they are shown standing near the margin of George III.'s lake, which was filled up about 1814.

Of the remainder of the trees that fell, few had more than ordinary interest. Near No. III. Museum a deodar was blown down. It was one of the numerous trees of this species that were planted by Sir William Hooker about 1845 at each side of the Broad Walk to form an avenue. Few of them succeeded, and latterly but few remained. This, the largest of them, was 64 ft. high and 8 ft. in girth of trunk.

The violence of the storm was most apparent in the northern part of the Gardens. The great extent of woodland to the south—one of Kew's most precious assets—suffered little, although many of the trees there have passed their zenith.

W. J. B.

The Seven Sister Elms.—In the previous note the destruction by wind of the last of this group of elms is recorded. It will be worth while for future reference to put on record the planting of seven others in their place, especially as the young trees are of interesting origin. They are *Ulmus campestris*, the common English elm, raised from seed sent to Prof. A. Henry in May, 1911, and collected from trees growing in the Royal Park of Aranjuez, on the Tagus, in Spain. Prof. Henry presented the plants to Kew in March, 1913. It is well known that the common elm rarely, if ever, produces fertile seeds in the British Isles, but reproduces itself freely by means of suckers. In low, warm situations in Spain, like Aranjuez, it ripens seed regularly, although, according to Prof. Henry, it does not do so in colder, more elevated places, such as Madrid and Toledo.

Of the elms at Aranjuez, Prof. Henry writes:—"The fact that these elms (and still older ones that previously existed in the Aranjuez Garden) ewre absolutely like the Windsor Park elms must continually have struck Ambassadors and other visitors from England to Spain, and may have given rise to Evelyn's story that the elms at Aranjuez, the Escurial, and other places belonging to the Kings of Spain were 'brought out from England' in the time of Phillip II. (see Evelyn's *Sylva*, p. 31, ed. ii.). I am inclined to believe that the English elm is really native of Spain, as it occurs in many localities (as a planted tree), and that our English elms are part of the Lusitanian flora. Their not producing seed may be due to the fact that the temperature of South Europe has lowered 4 deg. since neolithic times. It is, of course, remarkable that *Ulmus campestris* is totally absent from France."

On the date of planting (Feb. 9th, 1916) these young elms were 6 ft. or 7 ft. high. They are planted in approximately the same relative positions as the original "Seven Sisters," but about 10 yds. to the west.

W. J. B.

Botanical Magazine for April.—The plants figured are *Sophrolaelia Psyche*, Rolfe (t. 8654), a garden hybrid between *Laelia cinnabarina*, Lindl. and *Sophronitis grandiflora*, Lindl.; *Clematis Pavoliniana*, Pampanini (t. 8655) from Central China; *Euonymus Bungeanus*, Maxim. (t. 8656), from Manchuria and N. China; *Lupinus Chamissonis*, Eschsch. (t. 8657), from California and *Alnus cordata*, Desf. (t. 8658), a native of Italy and Corsica.

Nomina nuda published by C. Moore.—The following notes and identifications of certain *nomina nuda* published by the late Mr. C. Moore in his Catalogue of Plants in the Sydney Botanic Gardens, 1895, and hitherto omitted in the Index Kewensis, have been kindly supplied by Mr. J. H. Maiden, the present Director.

Araucaria elegans, C. Moore, l.c. 88 (New Caledonia) = A. Balansae, *Brongn. & Gris*. See Agric. Gaz. N. S. Wales, vol. xviii. p. 906 (1907).

Araucaria anitense [sic], C. Moore, l.c. (Aneitum, New Hebrides) = A. Cookii, *R. Br.* var. rigida, *Hort.*

Dammara pumila, *C. Moore* and D. spinulosa, *C. Moore*, l.c. 89 (New Caledonia).—These species appear to be identical. They have not yet coned in the Botanic Gardens, Sydney, and have therefore not been identified.

Euphorbia compacta, C. Moore, l.c. 81 (Polynesia) = E. neriifolia, *Linn.* var. compacta, *Hort.*

Ficus habrophylla, C. Moore, l.c. 84, is an error for the following:—

Ficus habrophylla, *G. Bennett*, Gatherings of a Naturalist in Australasia, p. 341 (1860), nomen; Seem. Fl. Viti. p. 248 (1865), descr. A native of Tana Island, New Hebrides. According to Bennett, the fruit when ripe is of a purplish-red colour and excellent for tarts and preserves.

Flindersia Greavesii, C. Moore, l.c. 16 = F. australis, *R. Br.* See Maiden, Forest Fl. N. S. Wales, vol. ii. p. 151 (1905).

Meryta undulata, *C. Moore*, l.c. 43 (Polynesia).—This species has not been identified hitherto.

Randia macrophylla, C. Moore, l.c. 47 = R. stipularis, *F. Muell.* Descr. Notes Papuan Pl. vol. i. p. 69, in obs.—*R. stipulosa*, F. Muell. Fragm. vol. vii. p. 47 (1869), non Miq. (1856).

M. L. G.

Teak in Trinidad.—The following note on the growth of Teak in Trinidad has been received from Mr. C. S. Rogers, Forest Officer, Trinidad and Tobago, with some interesting photographs, showing the remarkable size of the leaves and the vigour of the young trees:—

East Indian Teak, *Tectona grandis*, was first introduced into the plantations in the Forest Reserves in Trinidad in 1913.

The seeds were obtained from the Tharawaddy, Burma, through the courtesy of the Conservator of Forests, Pegu Circle.

In 1913 about 14½ acres were planted; 2½ acres being situated in the Southern Watershed Reserve, about 7 acres in the Arima Reserve, and 5 acres in the Central Range Reserve. In each locality the original forest containing no marketable timber of any consequence was felled, burnt, and lined out with stakes or pickets at 10 ft. by 10 ft.

So far the best results have been attained in the Central Range Reserve Plantation where 5 acres were planted 10 ft. by 10 ft. Of the 2178 pickets, 35 were on unplantable ground, the remaining 2143 were sown with Teak seeds in July (18th to 24th). The sowing was rather late owing to the impracticability of getting the area ready at an earlier date. In the following January (1914) 1339 pickets, at which seeds had not yet germinated, were re-sown.

At the end of March, 1914, 1758 Teak seedlings had resulted, and some of them were 6 to 10 ft. high. In the following wet season the blank pickets were again re-sown. At the end of March, 1915, when stock was taken it was found that there were only 12 blanks.

Some of the plants had attained a height of 23 ft., and leaves were measured up to 36 in. in length by 25 in. in width, the Teak being then between 20 to 21 months old from the date of sowing the seeds.

In October, 1915, a tree was measured and found to be 32 ft. high with a girth of 2 ft. at ground level, and 16½ in. at 3 ft., and 14½ in. at 5 ft. from the ground. Its age was 2 years and 3½ months from date of sowing.

The soil is a sandy loam of Tertiary origin. The elevation does not exceed 1000 ft. The original forest contained some trees of large size, but the more valuable species had been cut out, and the remainder were for the most part unsaleable owing to distance from a market.

The normal rainfall for the district is about 115 in., but during the last two years it has been 20 per cent. below the average.

Tarrietia utilis.—As the result of a re-examination of the seed of *Heritiera utilis** it seems desirable to transfer this species to the genus *Tarrietia*. Bentham and Hooker's classification† of the genera of *Sterculieae* was based on the arrangement of the anthers and the presence or absence of albumen in the seed, irregularly crowded anthers and albuminous seeds being stated by them to be characteristic of *Sterculia* and *Tarrietia*, whilst anthers arranged in a single ring and exalbuminous seeds were ascribed to *Cola* and *Heritiera*. There seems reason to believe that the division thus established does not correspond with the natural inter-relationships of these genera. The character of the annular or irregular arrangement of the anthers is very misleading, as there is great variation in this respect within the limits of a single genus, certain species of *Sterculia* (*e.g.*, *S. foetida*) and *Tarrietia* having the anthers distinctly arranged in a ring, so that, as far as the flowers are concerned, they might be taken for species of *Cola* and *Heritiera* respectively. A more natural grouping would be to associate on the one hand *Sterculia* and *Cola*, which have pluri-ovulate carpels and follicular fruit, and on the other hand *Tarrietia* and *Heritiera*, which have uni-ovulate carpels and indehiscent sycamore-like samaras.

The seed of *Heritiera utilis* separates readily into two equal parts which have all the appearance of cotyledons, but on examining a transverse section each cotyledon is seen to have outside it a thick layer of albumen of exactly the same length and breadth, and to which it is so closely applied that the seed has the appearance of being exalbuminous with thick plano-convex cotyledons. It may, perhaps, be questioned whether the single character of the presence or absence of albumen is sufficient to warrant the recognition of *Tarrietia* and *Heritiera* as independent genera, and the further question arises as to whether *Argyrodendron* is not generically distinct from the former. Until the genera of *Sterculieae* have been monographically revised, however, it will be convenient to take the presence of albumen as distinguishing *Tarrietia* from *Heritiera*, and the name *Tarrietia utilis*, Sprague, is, therefore, proposed for *H. utilis*.

Tarrietia utilis was discovered in the Gold Coast Colony by Mr. H. N. Thompson, and was described in 1908.‡ The specimens collected by Mr. Thompson bore unifoliolate leaves only. In the following year the species was described independently from Ivory Coast specimens by Dr. A. Chevalier, under the name *Cola proteiformis*,§ the specific name being given in allusion to the polymorphy of the leaves, simple, trifoliolate and digitate leaves occurring on the same individual and sometimes even on the same branch.‖ Gold Coast specimens with unifoliolate, trifoliolate and septemfoliolate leaves were received from Mr. T. F. Chipp in 1912. Finally in January of the

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* Kew Bull. 1909, p. 348; H. N. Thompson, Gold Cost, Report on Forests, t. 3.

† Gen. Pl. vol. i. p. 215.

‡ Kew Bull. 1908. p. 257. (*Triplochiton utile.*)

§ Vég Ut. Afr. Trop. Franç., vol. v. p. 250 (1909).

‖ l.c. vi. p. 60, fig. 9.

present year the known distribution of *T. utilis* was extended to Sierra Leone by the receipt of specimens from Mr. C. E. Lane-Poole, accompanied by some interesting notes which may be summarised as follows:—

Heritiera utilis is a large forest tree, common throughout the Colony and Protectorate. The roots are intermediate in character between the "buttress" and "prop" types, resembling the former in being flat, and the latter in that they raise the tree clear of the ground.* The timber is light and very easily worked, and takes a fine polish which shows up the grain very well. It has many names, the most common creole one being "Hamon," probably a corruption of Almond; it is also called "Red Cedar," which is a better name. The Mendis call it "Yawi," and hold it in high esteem. In the old days it was used for shingles, and the old records of Waterloo contain pages of complaints in regard to the shingling of the manager's house. It appears that it had to be renewed every five years.

Young seedlings up to a year old bear simple (unifoliolate) leaves only. From that time onwards until the tree flowers the leaves produced are digitate, but those of the flowering shoots are again simple.

Mr. Lane-Poole's remarks on the nature of the leaves carry the more weight in that they were based on continued observation of the young trees in the nurseries and plantations under his charge. Dr. Chevalier, whose notes were based on wild trees, states that certain branches bear simple leaves only, and others leaves with three, four or five leaflets, whilst yet other branches bear leaves of all these forms. A flowering specimen received from him in 1911 bears simple leaves only.

He describes *T. utilis* as a tree 80–100 ft. high, with a clear trunk 50-65 ft. high and $1\frac{3}{4}$–$2\frac{1}{2}$ ft. in diameter. The bark is reddish-gray, thick, with longitudinal cracks. The wood is red, of the same colour as mahogany, with a well-marked silver grain, moderately hard, density 0·583. It might serve as a substitute for mahogany, especially if it could be put on the market at less than 40 francs per ton.†

The distribution of *Tarrietia utilis*, as far as at present known, is as follows:—

Sierra Leone. Babadoori Valley, *Lane-Poole* 399. Ivory Coast. Alépé, *Chevalier* 16232;‡ Azagué, *Chevalier* 22293. Gold Coast Colony. Hunisu, *Thompson* 1; Imbraim, *Thompson* 25; Wassidimo, east of Bensu, *Chipp* 210; evergreen forest, Ajakwa, north of Chama, *Chipp* 204.

Vernacular Names. Sierra Leone: Hamon, Red Cedar, Yawi (Mendi). Ivory Coast: Kouanda (Attié), Gniangon (Agni), Kokotsi (Fanti). Gold Coast: Nyankom.

T. A. S.

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* A good illustration of the buttress roots of *Tarrietia Argyrodendron* (Queensland and N.S. Wales) is given in Queensl. Agric. Journ. vol. ii., p. 154.

† Vég. Ut. Afr. Trop. Franç. vol. v., p. 250 (1909). The price mentioned applied to the market conditions in 1908-09.

‡ Vég. Ut. Afr. Trop. Franç. v. p. 250.

Oil-bearing Nuts of the Philippines.—In a recently issued Commerce Report of the United States of America some particulars are given of two oil-producing seeds of the Philippine Islands known respectively under the vernacular names of *Calumpang* or *Kalumpag* and *Balucanag*. The first-mentioned is apparently the seed of *Sterculia foetida* (*Sterculiaceae*), a tall tree, widely distributed in the Tropics. The seeds have been analysed by the Philippine Bureau of Science and found to be edible though slightly purgative when eaten in quantities. The composition of the kernels is: fat (by extraction of dry seeds), 51·78 per cent.; protein (N × 6·25), 21·61 per cent.; starch, 12·10 per cent.; sugars, 5 per cent; cellulose, etc. (by difference), 5·51 per cent.; ash, 3·90 per cent.

The oil expressed from the Calumpang is sweet, with a comparatively high melting point. Its colour is a light yellow. One chemist reports that it appears to resemble olive oil very much in its physiological action. It is nontoxic and has no irritating action. It can be used in the same manner as olive oil and should be especially useful for culinary purposes.

According to Hooper in *Agricultural Ledger* No. 5, 1912, the average weight of the seeds is 2·4 grams. They are formed of an outer parchment-like skin, violet or purplish in colour. Below the skin is a dark fleshy pulp. The kernels are whitish and have a pleasant taste and yield a bland, light yellow, non-drying oil used in Java for culinary purposes and as a burning oil.

Differences have been noticed between the kernel oil and that extracted from the whole seed. The kernel oil is liquid and slightly viscous. With the Halpen test it gives a cherry-red colour. The oil obtained from the whole seed is similar to that of the kernel oil, but deposits white fats at the ordinary temperature. A peculiar property of the whole-seed oil, first observed by Wedemeyer, is its behaviour on heating to 240° to 245° when it is suddenly converted, with spontaneous generation of heat, into an india-rubber-like solid substance, no doubt due to a process of polymerisation similar to that which occurs with castor oil.

Small quantities of these seeds have occasionally been imported into this country but do not appear to have found a market. In the Philippines a decoction of the leaves is used as a wash in suppurative cutaneous eruptions and the astringent fruit is employed in Java as an injection in gonorrhœa and in Western India as an article of diet.

The other oil-bearing nut referred to is the "Balucanag" (*Chisochiton cumingianus*), belonging to a genus of trees and shrubs of *Meliaceae*, confined in distribution to the Eastern Tropics. The nut has also been under investigation by the Bureau of Science. The nut is known in many parts of the islands, from Northern Luzon to Southern Mindanao. The name "Balucanag," applied to it in Camarines and Laguna, is taken to indicate that the natives recognise the nuts as oil-bearing, for the same name is applied to another and well-known oil-bearing nut, although the two are not alike in any other particular. [See *Kew Bull.*, 1906, p. 119.]

The seed of *Chisochiton cumingianus* is described as half-ellipsoidal in shape, when fresh, and as averaging 3 cm. in length, and 2·5 cm. in width at the widest portion. The shell is rather hard, constituting about 60 per cent. of the total weight, and it is difficult to separate it from the contents. In a quantity of shelled nuts tested by the Bureau of Science, petroleum ether being used for the purpose, about 31 per cent. of the whole nut was a reddish-brown oil. The composition of the dry kernels was found to be as follows: fat (by extraction), 44·12 per cent.; protein (N × 6·25), 9 per cent.; ash, 3·19 per cent.

The dry kernel yielded 35·56 per cent. of oil on expression. The oil had a rancid odour and was non-drying. On experiment it was found to have purgative properties. This oil, however, was found to have a weaker laxative effect than castor oil, five parts of it being approximately equivalent to one part of castor oil. This oil, more commonly called cato, was found to be valuable for soap-making, and a local firm now employs the oil in that industry.

J. M. H.

Ajowan (*Carum copticum*).—An annual Umbelliferous plant widely cultivated in India for the seeds which are valued for their medicinal properties. The seeds are of importance commercially as the source of Thymol, a well-known antiseptic.

The technical laboratory of the Department of Industries, United Provinces of India, has issued a circular advocating the manufacture of Thymol in India, stating that it can be undertaken without any difficulty where the raw material is so plentiful, and that very good samples have been obtained as a result of experiments conducted at the laboratory. The circular says in part: Thymol was sold before the war at five to six shillings per pound. The price rose enormously soon after the supplies from Germany were stopped, and not so long since was quoted at 30s. per pound. It is obvious that the manufacture of thymol in India at the present time should yield a good return. Even under normal conditions there appears to be no reason why thymol should not be made in India at least as cheaply as elsewhere, seeing that we have the raw material in our midst, and a small company has recently been established at Dehra Dun for its manufacture. The apparatus required is simple and inexpensive. The demand for thymol both in India and in Great Britain is great, and there should be no difficulty therefore in finding a ready market.

It may perhaps be recorded that from seeds of this plant forwarded from the Royal Gardens, Kew, to the Imperial Commissioner of Agriculture in the West Indies plants have been successfully raised in St. Lucia, growing to a height of 2 ft., and flowering freely. The present value of Ajowan seed in the London drug market ranges from 18s. to 24s. per hundredweight.

J. M. H.

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Continued on p. 3 of cover.]

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

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No. 4] [1916

XVI.—DIONCOPHYLLUM.

T. A. Sprague.

The remarkable climbing shrub described by Baillon in 1890 under the name *Dioncophyllum Thollani** was originally discovered by M. Thollon in the Niari district, French Congo,† and was not found again until 1914, when flowerless shoots of it were collected by Mr. N. W. Thomas in Sierra Leone, 1800 miles away. These shoots long defied classification, and were only identified through the writer's attention being arrested accidentally by the apt generic name *Dioncophyllum*, which at once recalled the peculiar two-hooked leaves.

The following description‡ and figure are being published in the hope that further material of *Dioncophyllum* may be received from Forestry Officers or others interested in West African botany. Flowering shoots, fruits and ripe seeds are more especially desired, though specimens in any stage of development will be welcome. Care should be taken in drying the fruits to ensure their remaining attached to the leafy branchlets.

Dioncophyllum Thollani, *Baillon.*—A climbing soft-wooded shrub, apparently glabrous to the naked eye, but bearing numerous minute rust-coloured peltate scales, especially on the youngest parts. Branches (long-shoots) long and slender, terete, slightly glossy, bearing small leaves (2–3½ in. long, ⅓–¾ in. broad), each of which has a pair of strong revolute hooks at its apex, separated from the leaf-blade by a short stalk. In the axils of these hooked leaves are borne much contracted short-shoots, ¼–½ in. long, bearing 4–6 larger leaves (4–6 in. long, ¾–1 in. broad), obtuse at the apex and unprovided with hooks. Leaves alternate, shortly petioled, oblanceolate, entire, smooth; midrib well-marked on both surfaces, very prominent on the upper; lateral nerves numerous, fine, parallel, spreading, rather indistinct, even in a dried state, and probably not visible in the fresh leaf. The inflorescence is carried up the shoot, and does not arise from a leaf axil but laterally, or almost opposite a leaf. It is a loose irregularly branched cyme, without either bracts or bracteoles. Flowers hypogynous. Calyx short, 5-angled, 5-toothed. Petals, 5, contorted. Stamens

* Bull. Soc. Linn. Par. vol. ii. p. 870.
† Engl. Jahrb. vol. xl. p. 486 (1908).
‡ The description of the vegetative parts has been drawn up from Mr. Thomas's specimens, whilst that of the inflorescence and flowers is taken from Baillon.

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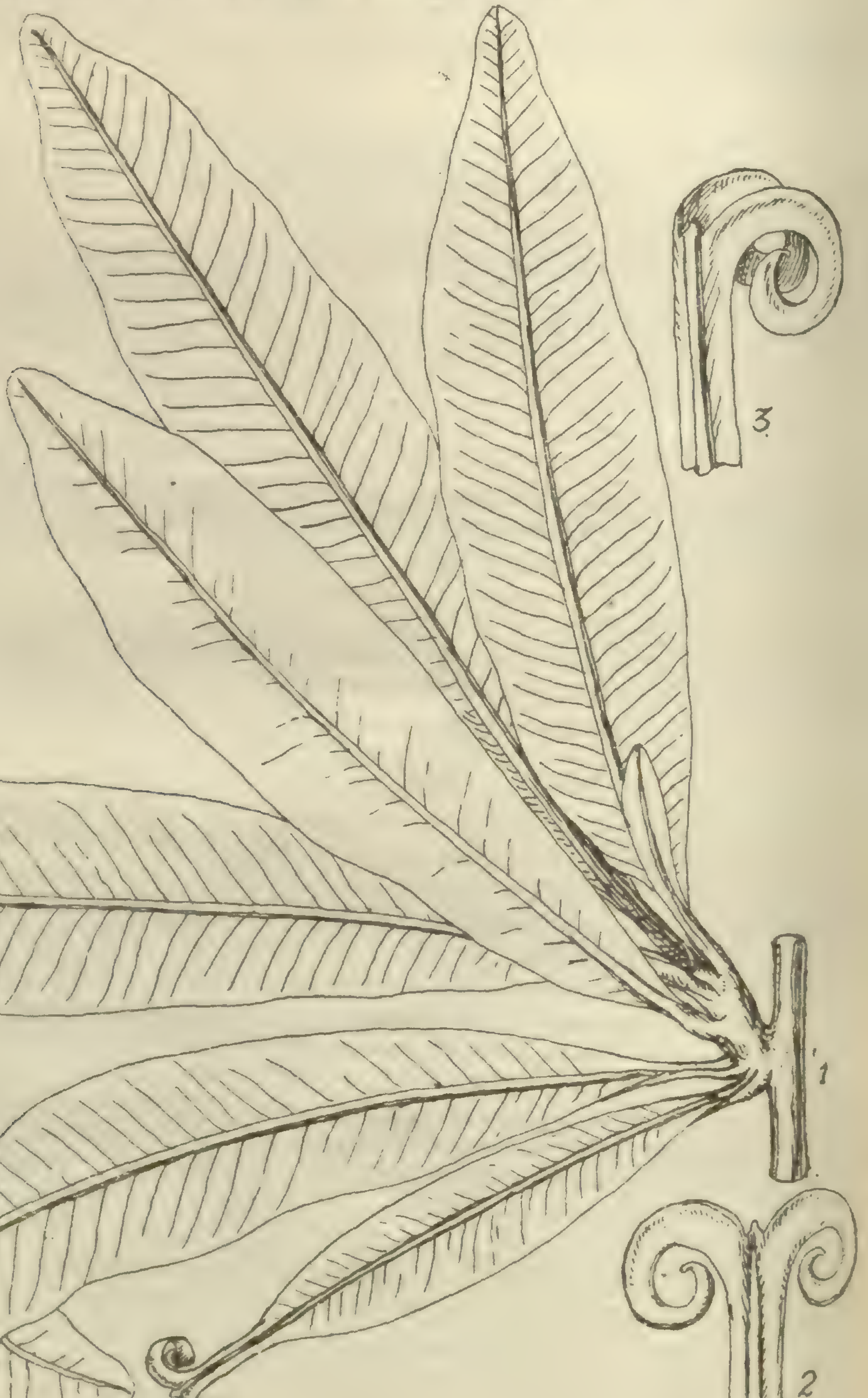
numerous, free; filaments slender; anthers basifixed, elongated, bilocular. Ovary unilocular; styles 5, each terminated by a globose stigma; placentae 5, parietal, each bearing numerous ovules. Ovules distant, transversely or obliquely inserted, anatropous. Fruit and seeds not yet known.



1. A portion of a branch with a small leaf terminated by a pair of revolute hooks. In the axil is a short leafy shoot.
2. The revolute hooks, front view.
3. The revolute hooks, in side view, showing the stalk, prominent midrib, and apical cusp.

Though it has not been possible to examine the type of *Dioncophyllum Thollonі* there can be little doubt that the Sierra Leone plant is conspecific with it. It is true that Baillon described *D. Thollonі* as quite glabrous, but the peltate scales are minute, and though readily observable through a lens on the youngest parts of the short-shoots, soon disappear, either falling off or being rubbed off. Thollon's material apparently did not include short-shoots, as Baillon made no mention of them or of leaves unprovided with an apical pair of hooks.

Before dealing with the systematic position of *Dioncophyllum* it is desirable to attempt a morphological interpretation of its peculiar leaves. On careful examination of the hooked leaves (leaves of the long-shoots), a minute cusp can be seen at the apex, between the two hooks. The leaf can be described empirically as consisting of the following parts from the base upwards: 1, petiole; 2, lamina; 3, a produced portion of the midrib, narrowly winged, and terminated by a minute cusp, each wing of the produced midrib passing outwards from the base of the cusp into an indurated revolute hook.

If the leaf is simple and the apparent lamina is a true lamina, then we have a case of apical bifurcation of the lamina and the conversion of each branch of it into a hooked tendril. If, on the other hand, the leaf is compound, the apparent lamina may be interpreted as a winged petiole,* the hooks as representing lateral leaflets (or their petiolules) and the apical cusp as a terminal leaflet (or its petiolule) or a reduced rhachis. The latter view commends itself to the writer.

According to Baillon, *Dioncophyllum* forms a connecting link between the Bixaceae (Flacourtiaceae) and the Passifloraceae. Warburg placed it provisionally in the Flacourtiaceae-Euscolopieae, but stated that the presence of tendrils suggested Passifloraceae;† Gilg also referred it to the Flacourtiaceae, but regarded it as representing a new group of that family.‡

As the only material of *Dioncophyllum* in the Kew Herbarium consists of two flowerless shoots, the details of the floral morphology cannot at present be confirmed. Judging from Baillon's description, however, the genus should be referred to the Passiflorales,§ but cannot yet be assigned to any family. With a view to ascertaining its affinities Miss F. M. Scott very kindly undertook an examination of the anatomy of the stem and leaf, and her report thereon is appended. Although it proved to be impossible to determine the systematic position of *Dioncophyllum* by means of its anatomical characters, the presence of cortical bundles and internal phloem afford some confirmation of the view that the genus is referable to the Passiflorales, as the former occur in Turneraceae and Begoniaceae,

---

* This interpretation is in keeping with the great prominence of the midrib on the upper surface of the leaf.

† Engl. & Prantl. Nat. Pflanzenfam. vol. iii. 6a, p. 30 (1893).

‡ Engl. Jahrb. vol. xl. p. 486 (1908).

§ Sensu lato, including Flacourtiaceae, Bixaceae, Cochlospermaceae, Violaceae and Cistaceae in addition to the families referred to it by Bentham and Hooker. The removal of the Cucurbitaceae to the Gamopetalae by Engler does not appear to be justified.

and the latter is characteristic of Cucurbitaceae.* The presence of peltate scales lends further weight to this view, as they have been recorded for Flacourtiaceae, Bixaceae, Cistaceae, Begoniaceae and Datiscaceae.

The great resemblance which *Dioncophyllum* bears to *Nepenthes* should also be kept in mind as possibly indicative of a remote affinity with the Sarraceniales. The lamina-like organ terminated by a double tendril (there is only one tendril in *Nepenthes*), the presence of peltate scales, and the extra-axillary ebracteate inflorescence suggest an affinity with *Nepenthes*, but the floral characters are very different. The fruit and seeds, when known, will probably shed light on the relationships of this remarkable plant.

The Anatomy of Dioncophyllum.

Miss F. M. Scott.

From a study of the anatomical features it has been impossible to determine the systematic position of *Dioncophyllum*. Indeed, the family with which it shows the most agreement, viz., the Melastomaceae, is far removed from it in floral morphology.

The most important characters of the stem are the presence of both cortical bundles and internal phloem. The cortex is differentiated into (1) an outer compact tanniferous layer; (2) a fibrous layer; (3) an inner layer of loose parenchyma. In the fibrous ring run the cortical bundles. These were sixteen in number in the stem examined. They vary considerably in size. They are collateral and inversely orientated. The inner cortex is composed of large and small polygonal cells, the latter containing tannin. The pericycle contains a number of scattered fibres. Sieve tubes and companion-cells were recognised in both inner and outer phloem, but no fibres are present. The wood-fibres of the xylem have bordered pits. The vessels are large and have simple perforations and bordered pits towards parenchyma. The medullary rays are uniseriate. The pith is loose in texture and is strengthened by the presence of stone-cells. Tannin and calcium oxalate are abundant.

The two kinds of leaves, *i.e.*, those on the short and long shoots, appear to be identical in structure. They are bifacial but tend to be centric. The prominent midrib is strengthened above and below by arcs of sclerenchyma, which almost form a complete ring. In these arcs, in the same relative position as in the middle cortex of the stem, lie collateral vascular bundles, inversely orientated. The central bundle of the midrib is supported by a ring of fibres. From the herbarium material examined it was impossible to determine whether this bundle was bicollateral or collateral. The stomata are surrounded by ordinary epidermal cells in no definite arrangement. Calcium oxalate is present in the epidermis.

* Solereder, Syst. Anat. Dicot., Engl ed., pp. 383, 389.

XVII.—DIAGNOSES AFRICANAE: LXVI.

1571. **Struthiola recta,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 37, anglice [Thymelaeaceae-Euthymelaeeae]; affinis *S. virgatae*, Linn., foliis linearibus calycisque lobis acutis differt.

Caulis erectus, apice sparse ramosus, primum pilosus, demum glaber et cinerascens. *Folia* opposita, linearia, obtusa, 8 mm. longa, 0·3 mm. lata, primum sparse pilosa, mox glabra. *Flores* in foliorum superiorum axillis posita. *Calycis* tubus pubescens, 1·2 cm. longus, tenuis, curvatus; lobi oblongi, acuti, 3 mm longi, 0·3 mm. lati. *Petala* 8, clavata, 1 mm. longa, pilis circumdatis breviora. *Antherae* breviter apiculatae. *Ovarium* oblongum, 2 mm. longum, glabrum: stylus filiformis, 8 mm. longus; stigma penicillatum.

South Africa. Swellendam Div.; Swellendam, 240–610 m., *Mund* 25.

1572. **Struthiola confusa,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 38, anglice [Thymelaeaceae-Euthymelaeeae]; species *S. virgatae*, Linn.; proxima, foliis lineari-lanceolatis differt.

Suffrutex erectus, e basi multiramosus. *Rami* primum pilosi. *Folia* lineari-lanceolata, obtusa, 6 mm. longa, apice pilorum penicillo instructa, ciliata, mox glabrescentia. *Flores* in foliorum summorum axillis dispositi: bracteolae vix 3 mm. longae, oblongae, obtusae, ciliatae. *Calycis* tubus sparse pubescens, 1·2 cm. longus, supra gradatim dilatatus; lobi ovati, obtusi, 3 mm. longi, 1·5 mm. lati. *Petala* 8, quam calycis lobi dimidio breviora, pilis aequilongis circumdata *Antherarum* connectivum obtusum, breviter productum. *Ovarium* oblongum, glabrum; stylus filiformis; stigma penicillatum.

South Africa. Tulbagh Div.; mountains near the waterfall, 360 m., *Bolus* 5263, *Pappe;* Witzen Berg, behind Steendahl, 610 m., *Bolus* 5378. Cape Div.; beyond Raapenberg Vley, *Wolley-Dod* 340.

This species resembles *S. erecta*, Linn., but differs in having a pubescent calyx with obtuse lobes.

1573. **Struthiola leiosiphon,** *Gilg* ex *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 38, anglice [Thymelaeaceae-Euthymelaeeae]; species *S. rigidae*, Meisn., affinis, calycis tubo multo longiori differt.

Suffrutex multiramosus. *Rami* primum pubescentes, demum glabri et foliorum cicatricibus prominentibus scabri. *Folia* lanceolata, concava, 1·2 cm. longa, 3 mm. lata, primum pilosa, demum glabra et in dorso tuberculata. *Flores* in foliorum summorum axillis posita: bracteolae 6 mm. longae, 1 mm. latae, dense ciliatae. *Calycis* tubus glaber, 2·4 cm. longus, 0·3 mm. diametro, cylindricus; lobi ovati, acuminati, 5 mm. longi, 2·5 mm. lati. *Petala* 12, fere 2 mm. longa, oblonga, pilis vix aequilongis circumdata. *Ovarium* 2 mm. longum, oblongum, glabrum; stylus filiformis, 1·8 cm. longus; stigma parvum.

South Africa. Caledon Div.; tops of the mountains of Baviaans Kloof, near Genadendal, *Burchell* 7730.

1574. **Struthiola ramosa,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 39, anglice [Thymelaeaceae-Euthymelaeeae]; species *S. Mundtii*, Eckl., affinis foliis oblongo-lanceolatis obtusis differt.

Suffrutex multiramosus. *Rami* primum pubescentes, demum glabri, foliorum cicatricibus parvis scabri. *Folia* oblongo-lanceolata, 7 mm. longa, 2 mm. lata, dense albociliata, demum glabra, siccate longitudinaliter sulcata. *Flores* in foliorum superiorum axillis dispositi; bracteolae 2 mm. longae, oblongae, costa valida et marginibus membranaceis praeditae. *Calycis* tubus glaber, 1 cm. longus, supra leviter inflata costataque; lobi ovati, obtusi, 2 mm. longi. *Petala* 12, oblonga, 1·5 mm. longa, pilis aequilongis circumdata. *Ovarium* oblongum, glabrum; stylus filiformis, calycis tubo aequilongus; stigma penicillatum.

South Africa. Without precise locality, *Mund.* Tulbagh Div.; Witzenberg Range, *Zeyher.*

1575. **Struthiola Galpini,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 39, anglice [Thymelaeaceae-Euthymelaceae]; species *S. Mundtii*, Eckl., affinis, ramis primum pubescentibus (nec villosis) differt.

Rami primum pubescentes, demum glabri, leviter cicatricosi. *Folia* approximata, lanceolata, acuta, 7 mm. longa, 2 mm. lata, primum dense albociliata, demum glabra nitidaque. *Flores* in foliorum summorum axillis congesti; bracteolae ovatae, acutae, 2 mm. longae, 1·5 mm. latae, dense ciliatae, herbaceae. *Calycis* tubus glaber, 1·2 cm. longus, leviter curvatus, supra gradatim expansus; lobi ovati, subacuti, 3 mm. longi, 1·5 mm. lati, tenues. *Petala* 12, quam calycis lobi dimidio breviora, pilis aequilongis circumdata. *Antherarum* connectivum acutum. *Ovarium* oblongum, glabrum; stylus filiformis, 8 mm. longus; stigma penicillatum.

South Africa. Riversdale Div.; Milkwoodfontein, 180 m., *Galpin* 4508.

1576. **Struthiola Garciana,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 40, anglice [Thymelaeaceae-Euthymelaeeae]; species ex affinitate *S. Martianae*, Meisn., a qua foliis oblongis obtusis differt.

Caulis erectus, simplex vel parce ramosus, primum pilosus, rubescens. *Folia* oblonga, obtusa, 1·2 cm. longa, 2 mm. lata, primum dense albociliata, coma alba terminata. *Flores* in foliorum superiorum axillis positi; bracteae 1·2 cm. longae, 2·3 mm. latae, lanceolatae, acuminatae, dense albociliatae. *Calycis* tubus pubescens, 2 cm. longus, 1 mm. diametro, cylindricus; lobi lanceolati, acuminati, 3 mm. longi, 1 mm. lati, extra pubescens. *Petala* 12, clavata, 2 mm. longa, pilis aequilongis circumdata. *Antherae* oblongae, acuminatae, 2 mm.

longae. *Ovarium* oblongum, 1 mm. longum, glabrum; stylus filiformis; stigma penicillatum.

South Africa. Riversdale Div.; near Garcias Pass, *Burchell* 7152. Humansdorp Div.; Kruisfontein, near Humansdorp, *Galpin* 4510.

1577. **Struthiola fasciata,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 41, anglice [Thymelaeaceae-Euthymelaeeae]; species ex affinitate *S. tomentosae*, Andr., a qua calycis tubo multo breviore differt.

Suffrutex fasciculatim ramosus; rami primum dense lanati; foliorum cicatrices vix prominentes. *Folia* opposita, linearia, obtusa, 7 mm. longa, vix 1 mm. lata. *Flores* in foliorum summorum axillis positi, foliis paullo longiores; bracteae lanceolatae, acutae, marginibus densissime lanatis. *Calycis* tubus 7 mm. longus, pubescens; lobi ovati, acuti, 2 mm. longi, 1·5 mm. lati. *Petala* 12, oblonga, subacuta, pilis circumdatis paullo longiora. *Antherae* apiculatae. *Ovarium* oblongum, glabrum; stylus filiformis; stigma parvum.

South Africa. Swellendam Div.; between Zuurbraak and Buffelsjagts River Drift, *Burchell* 7266.

1578. **Gnidia orbiculata,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 47. anglice [Thymelaeaceae-Euthymelaeeae]; species distinctissima ex affinitate *G. oppositifoliae*, Linn., a qua foliis orbicularibus differt.

Frutex erectus, corymbose ramosus; rami erecti, glabri. *Folia* opposita, orbicularia, 4–6 mm. diametro, breviter cuspidata, uninervia, glabra. *Flores* ad ramorum apicem pauci. *Calyx* extra tomentosus, citrinus; tubus 1·6 cm. longus, subcylindricus. costatus: lobi orbiculares, 3 mm. diametro. *Petala* 4, antheris simulantia, crassa, 1·3 mm. longa, breviter unguiculata. *Antherae* oblongae, obtusae, 1·3 mm. longae.

South Africa. Uniondale Div.; in damp places by the Aapies River, in Long Kloof, *Burchell* 4945. Without locality, *Thom* 162.

1579. **Gnidia quadrifaria,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 50, anglice [Thymelaeaceae-Euthymelaeeae]; *G. stypheliodi*, Meisn., affinis, foliis anguste lanceolatis stricte quadrifariis distinguitur.

Frutex ramosissimus; rami tenues, rubescentes, primum pubescentes, foliorum cicatricibus subprominentibus. *Folia* approximata, subopposita, anguste lanceolata, acuminata, 1 cm. longa, fere 2 mm. lata, subtus trinervia, distincte quadrifaria, glabra, marginibus parte superiore inflexis. *Flores* pauci ad ramorum apicem positi. *Calyx* flavus, extra pubescens; tubus 8 mm. longus; lobi ovato-lanceolati, 4 mm. longi, 2 mm. lati. *Petala* 4, membranacea, 3 mm. longa, 2 mm. lata. *Antherae* oblongae, 1 mm. longae, superiores exsertae filamentis 1 mm. longis instructae. *Ovarium* oblongum, apice pilosum; stylus calycis tubo fere aequilongus; stigma capitatum.

South Africa. Humansdorp Div.; Kruisfontein Mountains, 300 m., *Galpin* 4518.

1580. **Gnidia myrtifolia,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 51, anglice [Thymelaeaceae-Euthymelaeeae]; species ex affinitate *G. stypheloidis*, Meisn., foliis ovatis acuminatis differt.

Frutex dense ramosus; rami breves, tenues, rubescentes, primum hirsuti, mox glabrescentes, foliorum cicatrices parvae. *Folia* opposita, approximata, ovata vel ovato-oblonga, 1 cm. longa, circiter 4 mm. lata, acuminata, coriacea, glabra marginibus verrucosis parte superiore exceptis, 3–5-nervia. *Flores* pauci ad ramorum apicem positi. *Calyx* extra pubescens; tubus 1 cm. longus, anguste infundibuliformis; lobi ovato-lanceolati, apice acuti incrassatique, 4 mm. longi, 2 mm. lati. *Petala* 4, membranacea, 2 mm. longa, 1·5 mm. lata. *Antherae* oblongae, obtusae, vix 1 mm. longae, superiores filamentis 1 mm. longis praeditae. *Ovarium* ovoideum, apice pilosum; stylus quam calycis tubus longior, crassus; stigma papillosum.

South Africa. East London Div.; plains near Cove Rock, East London, 15 m., *Galpin* 3177; hill near Kwenquea River Mouth, 90 m., *Galpin* 5803.

XVIII.—USEFUL WOODS OF CORNACEAE.

W. Dallimore.

The family *Cornaceae* is not a very important one from an economic standpoint, although it includes several genera which provide useful timber trees and a number of species that possess medicinal properties. The uses of the wood of various species of *Cornus* are enumerated in *K.B.* 1915, pp. 179–181 and the succeeding notes indicate the more important timber trees of other genera.

Curtisia faginea, *Aiton.*—Hassagay-wood, Assegai-wood, Assegai-hout, Assagay-boom, Cape Lancewood.

This is one of the most useful hardwoods of South Africa, where it usually occurs as a small tree 20 40 ft. high with a diameter of 12–18 in., although it sometimes grows 60 ft. high with a diameter of 2 ft. It is present in all the Cape forest districts as well as in Natal and the Transvaal, young trees from cut-over stumps or from naturally-sown seeds being plentiful, though mature trees in easily accessible places are scarce. Its leaves are evergreen, opposite, oval or elliptical, with deeply-toothed margins, 1–3 in. or more long and 1–2 in. wide. The flowers are small and have no decorative merit. The wood is tough, heavy (sometimes 60 lbs. to the cubic foot), close-grained, durable, and capable of taking a good finish and polish; sap-wood yellowish and heart-wood red or brown. T. R. Sim, "Forest Flora of Cape Colony," p. 231, says that it makes very durable and superior furniture, tools, etc. With regard

to its use for spokes and felloes he adds that it is more constantly in demand than any other kind. Specimens of the wood, with polished turnery work and an assegai shaft, are to be seen in Museum No. I at Kew, and in Museum No. III there is a plank 18½ in. wide.

Griselinia littoralis, *Raoul.*—Papauma.

Two species of *Griselinia*, natives of New Zealand, are grown in the British Isles, but neither one attains timber size here. *G. littoralis* is a handsome evergreen tree 40–60 ft. high in New Zealand, with a trunk 2–4 ft. in diameter. The leaves are usually broadly oval, thick in texture, yellowish-green in colour, and 2–3 in. long. Male and female flowers are borne by different trees, the former being yellow, the latter green. The fruits are as large as garden peas and dark purple or almost black in colour. Kirk, "Forest Flora of New Zealand," pp. 69–70, says that the timber is very durable and of considerable value notwithstanding its small dimensions, for it is rarely obtained in greater lengths than 12 ft., on account of the crooked character of the trunk. It is dense, firm, compact, slightly brittle although of great strength, reddish in colour, shrinks very little in drying and is used for house-blocks, fencing-posts, sleepers, boat and ship timber, and other purposes. It is sometimes used for inlaying but is not in demand for cabinet-work. In the warmer parts of the British Isles it forms a fine bush 12–20 ft. or more high and reproduces itself from seed.

G. lucida, *Forster.*—Puka.

This is of smaller dimensions than the last-named for, in New Zealand, according to the conditions under which it is growing,, it reaches maturity at heights varying from 3–30 ft.. the trunk diameter of the best examples being rarely more than 12 in. In its native country it is both epiphytal and terrestrial in its habits; some plants begin life as epiphytes, and after sending roots down from their support to the soil, continue and end their life as terrestrials. Its leaves are oval or elliptical, 3–7 in. long and half as wide, dark glossy green, and thick in texture. Kirk, l.c., pp. 67–68, says that the wood, though small, is dense, compact and very durable, being used for posts, millwrights' work and other purposes. It is usually brownish in colour. In the British Isles it is less hardy than *G. littoralis*, but grows well in the warmer parts of Devonshire and Cornwall.

Nyssa sylvatica, *Marshall.*—Tupelo, Tupelo gum, Sour gum, Black gum, Yellow gum, Pepperidge, Stinkwood, Hazel pine, Bay poplar.

This is an important North American tree distributed over a wide range of country from S. Canada to Florida and Texas. It usually occupies wet or moist land, often growing in swamps and marshes with *Liquidambar styraciflua.* Under favourable conditions it averages 60–65 ft. in height, with a trunk diameter of 2½–3½ ft., but is sometimes upwards of 100 ft. high. The leaves are deciduous, oval, 3–4 in. long, glossy, and become brilliantly coloured in autumn. The wood is light, soft but tough,

splits badly, planes well and is used for hubs of wheels, interior finish of houses, backs and drawers of cabinets, boxes and for other purposes for which canary white wood or yellow poplar (*Liriodendron Tulipifera*) can be used, in fact there is a certain resemblance between the wood of the two trees. The sap-wood is pale yellow, and the heart-wood light brown. Hough, "American Woods," i, No. 9, pp. 53-54, gives a good account of the wood and its uses. In addition to its use in the United States it is exported to the British Isles and other countries.

Other American Nyssas that provide useful timber are *N. biflora*, Walters, Water gum, Black gum or Water tupelo, which Sargent includes as a variety of *N. sylvatica; N. Ogeche*, Marshall,—the Ogeche lime, Gopher plum, or Sour tupelo; and *N. aquatica*, Marshall, the Cotton gum or Tupelo gum. The timber of these trees is very like that of *N. sylvatica*, and is used for similar purposes. Descriptions of the various American Nyssas are given by Sargent in his "Silva of N. America, v, pp. 73-84."

N. sessiliflora, *Hooker*, is a large evergreen tree native of the Himalaya. Its wood does not appear to have been used for any special purpose.

Marlea vitiensis, *Bentham.*—Musk-tree.

Specimens of the wood of this Australian tree are to be seen in Museum No. I at Kew. The sap-wood is bright yellow, and the heart-wood dark brown or black, the sap-wood being greatly in excess of the heart-wood. It is close-grained and has the appearance of being a good cabinet wood, or it might be used for turnery. Maiden, in "Useful Native Plants of Australia," p. 568, says that it forms a tree 20–30 ft. high, with a trunk 6–12 in. in diameter, when growing in New South Wales and Queensland.

Alangium Lamarckii, *Thwaites* = *A. decapetalum*, Lamarck.

A small tree or shrub widely distributed in S. India, Ceylon, the Malay Peninsula, Philippine Islands and other countries. The wood, though of small size, is heavy, close-grained, strong and of good appearance, the sap-wood yellow and the heart-wood brown. It has been used in Madras for pestles, oil-mills, and other purposes. Drury, "The Useful Plants of India," 1873, p. 24, says that the juice of the root is credited with anthelmintic and purgative properties, and that it is employed in dropsical cases, and, pulverised, is a reputed antidote for snake-bites.

Mastixia arborea, *C. B. Clarke.*

This is a large-growing evergreen tree native of S. India and Ceylon. The wood is said to be soft and greyish in colour, but it appears to be in small demand. *M. pentandra*, Blume, from the forests of Western India also produces a greyish wood which is soft but of good appearance. A specimen of the last-named may be seen in Museum No. I, at Kew.

Toricellia tiliaefolia, *DC.*

According to Gamble, "A Manual of Indian Timbers," p. 392, this is a tree with white, even-grained, moderately hard

wood, native of the Eastern Himalaya. He says that it is a small tree at Darjeeling, but refers to S. E. Peal as saying that it grows to an immense size in Assam, 60–70 ft. to the first branch, and up to 20 ft. in girth, the wood being used for tea boxes.

Garrya elliptica, *Douglas.*—Silk-tassel-tree, Quinine-tree.

This Western N. American shrub or small tree is grown in the British Isles for the sake of its evergreen leaves and long, pendent catkins of yellowish-green flowers which develop during winter. The wood has little value, although Britton, "North American Trees," p. 736, says that it is sometimes used for fancy cabinet work, and adds that it is hard, close-grained, greyish-brown, and polishes well but checks badly. It is found from Monterey northwards to the Columbia River, as a shrub or small tree up to 20 ft. high.

Aucuba himalaica, *Hooker,* and **A. japonica,** *Thunberg.*

Although the former species sometimes grows to the dimensions of a small tree in the Himalaya, both are better known as large evergreen bushes. The wood is sometimes 6–9 in. in diameter, and its chief use appears to be firewood. In Museum No. I at Kew, tooth-picks are to be seen made from the wood of *A. japonica.*

Corokia buddleoides, *A. Cunningham.*

Of the several species of *Corokia* this is probably the most vigorous. It is a native of New Zealand, where it forms an evergreen, yellow-flowered shrub or tree 10 14 ft. high. The wood does not appear to possess any special value although it is hard, close-grained and of good appearance.

XIX.—NOTES ON AFRICAN COMPOSITAE: I.

J. Hutchinson.

Schistostephium, *Less.*

Three species of this genus, *Schistostephium hippiaefolium* (DC.), *S. heptalobum*, Oliv. & Hiern, and *S. griseum* (Harv.) were included by Harvey in the Flora Capensis (following DeCandolle) in the genus *Tanacetum*, L. But as Bentham* has pointed out they all differ from *Tanacetum* proper in having 4-lobed and not 5-lobed corollas in the hermaphrodite flowers, and they agree in every respect, except a trivial distinction in the sexes, with the genus *Schistostephium*, Less. As thus limited *Tanacetum* is entirely boreal, and *Schistostephium* South and South-tropical African in distribution. The latter genus is represented in Harvey & Sonder's Flora Capensis, vol. iii. p. 168, by three species, *S. flabelliforme*, Less., *S. rotundifolium*, Fenzl, and *S. crataegifolium*, Fenzl. To these are now added the three

* Benth. et Hook. f. Gen. Pl. ii. 432.

above mentioned. *S. oxylobum*, S. Moore, from Gazaland, and five new species here described.

CLAVIS SPECIERUM.

Capitula solitaria, longissime pedunculata — 1. *S. griseum.*

Capitula corymbosa:—

Folia petiolata, flabellatim lobulata vel dentata:—

Foliorum lobuli vel dentes rotundati; lamina dense sericea; corollae ♀ glabrae ... ... — 2. S. *flabelliforme.*

Foliorum lobuli vel dentes triangulares, plerumque acuminati; lamina pubescens; corollae ♀ glandulosae — 3. *S. rotundifolium.*

Folia sessilia, pinnatim vel palmatim partita vel lobata:—

Folia dense sericeo-villosa:—

Foliorum segmenta lata; flores ♀ distincte 4-lobati ... ... — 4. *S. villosum.*

Foliorum segmenta angustissima; flores ♀ imperfecte 2–3-dentati — 5. *S. crataegifolium.*

Folia breviter pubescentia vel glabra:—

Folia palmatim lobata vel partita, lobis ascendentibus:—

Capitula 3–4-nata; pedunculi ultimi gracillimi, circiter 2 cm. longi ... ... — 6. *S. Rogersii.*

Capitula numerosa; pedunculi ultimi robusti, 3–6 mm. longi:—

Caulis dense molliter tomentosus; capitula 5 mm. diametro ... — 7. *S. mollissimum.*

Caulis appresse puberulus; capitula 8 mm. diametro ... ... — 8. *S. dactyliferum.*

Folia pinnatim lobata vel partita, lobis a costa sub angulo 90° abeuntibus:—

Foliorum lobi integri:—

Foliorum loborum sinus latus, apertus, lobis marginibus parallelis — 9. *S. saxicola.*

Foliorum loborum sinus angustus, lobis marginibus curvatis ... — 10. *S. heptalobum.*

Foliorum lobi dentati vel lobulati:—

Foliorum lobi utrinque numerosi, lobo terminali parvo ... — 11. *S. hippiaefolium.*

Foliorum lobi utrinque circiter 3, lobo terminali magno flabellato ... ... — 12. *S. oxylobum.*

1. **S. griseum,** *Hutchinson*, **comb. nov.**
Tanacetum griseum, Harv. in Harv. et Sond. Fl. Cap. iii. 168 (1865).

South Africa.—Eastern Region:* East Griqualand; stony places on Botha's Hill, 800 m., Oct., *Medley Wood* 1479; rough places around Clydesdale, 800 m., Dec., *Tyson* 1066, 2172. Natal: Eastcourt, *Rehmann* 7319; near Gourton, Little Tugela River, Dec., *Medley Wood* 3667; without definite locality, *Gerrard* 1050.

2. **S. flabelliforme,** *Less.* Syn. Comp. 251 (1832); Harv. in Harv. et Sond. Fl. Cap. iii. 168.
Tanacetum argyreum, DC. Prodr. vi. 134 (1837).
Schistostephium argyreum, Fenzl ex Harv. l.c., nomen (1865).

South Africa.—Karroo Region: Somerset East, *Bowker*.
Kalahari Region: Transvaal, *McLea in Herb. Bolus* 5736.
Eastern Region: Albany; amongst grass near Grahamstown, 700 m., Apr.–May, *MacOwan* 530. Cathcart: amongst rocks on Amatola Mt., May, *Tyson* 1067. Stockenstrom: Katberg, *Shaw*. Tembuland: between Morley and Umtata River, grassy heights, 320–640 m., May, *Drège b*.

3. **S. rotundifolium,** *Fenzl* ex Harv. in Harv. et Sond. Fl. Cap. iii. 169 (1865); Oliv. et Hiern in Oliv. Fl. Trop. Afr. iii. 399.
Tanacetum rotundifolium, DC. Prodr. vi. 133 (1837): Drège, Zwei Pflanzengeogr. Docum. 152.

South Africa.—Kalahari Region: "New Caledonia," Drakensberg, *McLea in Herb. Bolus* 3007. Transvaal: near Lydenburg, Dec.–Jan., *Atherstone*.
Eastern Region: Swaziland; high veld near Dalriach, Mbabane, 1550 m., Dec., *Bolus* 12019. Natal: Inanda. July, *Medley Wood* 139; Friedenau Farm, Alexandra distr., May, *Rudatis* 649; "Natal," *Gerrard* 1052. Pondoland: between Omsamwubo and Omsamcaba, rocky places and forests margins below 330 m., May, *Drège*.

4. **S. villosum,** *Hutchinson*, **sp. nov.**

Suffruter circiter 4·5 dm. altus; caulis erectus, sulcatus, dense villosus. *Folia* sessilia, ambitu obovata vel oblongo-oblanceolata, pinnatilobata, 3-5 cm. longa, 2·5–3 cm. lata, chartacea, utrinque sericeo-villosa, lobis ovatis acutis circiter 5 mm. longis et 3–4 mm. latis; nervi laterales utrinque prominentes. *Capitula* homogoma, numerosa, laxe corymbosa; pedunculi usque ad 1 cm. longi, sericei. *Involucra* subturbinato-campanulata, apice 7–8 mm. diametro; bracteae circiter 4-seriatae, lineari-subulatae, ab extremo sensim longiores, usque ad 4·5 mm. longae, dense cinereo-sericeae. *Flores* numerosissimi; corollae tubus leviter ampliatus, 2·5 mm. longus, superne extra minute glandulosus; lobi 4,

* South African regions according to Bolus, Sketch of the Floral Regions of South Africa (Science in South Africa, 1905).

triangulares, obtusi, 0·75 mm. longi; achaenia 1·5 mm. longa, glabra.

South Africa.—Kalahari Region: Orange River Colony; *Cooper* 2523.

Eastern Region: Natal; Drakensberg, Biggarsberge, *Rehmann* 7084; without definite locality, *Gerrard* 1051. Zululand: 1330–1660 m., Mar., *Wylie in Herb. Medley Wood* 8841. Swaziland: grassy slopes at Hlatikulu, *Stewart* 77.

In herbaria this species will be found confused with *S. crataegifolium*, Fenzl., a plant with deeply cut narrow delicate leaves and much smaller flower heads.

5. **S. crataegifolium,** *Fenzl* ex Harv. in Harv. et Sond. Fl. Cap. iii. 169 (1865).

Tanacetum crataegifolium, DC. Prodr. vi. 134 (1837). *T. consanguineum*, DC. l.c.

Schistostephium artemisiaefolium et *S. microcephalum*, Baker in Kew Bull. 1897, 270.

S. Homblei, DeWild. Études Fl. Katanga, 170 (1913), ex descriptione.

Tropical Africa.—Belgian Congo: Elisabethville, Mar., *Homblé* 228. 292; Kundelungu, Mar., *Kässner* 2582. Nyasaland: Nyika Plateau, 2000–2500 m., July, *Whyte* 225; between Kondowe and Karonga, 600–1800 m. alt., July, *Whyte*.

South Africa.—Upper Region: Albert, *Cooper* 619.

Kalahari Region: Basutoland; Leribé, *Dieterlen* 289. Transvaal: Modderfontein, in the bush, *Conrath* 403; Houtbosh, *Rehmann* 6067; near Lydenburg, Oct., *Wilms* 690.

Eastern Region: Alexandria; between Hoffmanskloof and Drie Fontein, 320–640 m., Nov., *Drège a.* Albany; between Grahamstown and Blue Krantz, Sept., *Burchell* 3619; amongst shrubs near Grahamstown, *MacOwan*. East Griqualand; in rocky places around Clydesdale, flowers yellow, Mar., *Tyson* 3159; rocky hills around Kokstad, Mar., *Tyson* 454. Tembuland; Baziya, Feb., *Baur* 80. Natal; amongst grass at Umzumbi, Afr., *Medley Wood* 3109; "Natal," *Gerrard* 435; *Cooper* 3504.

6. **S. Rogersii,** *Hutchinson*, sp. nov.

Herba basi lignosa, erecta, superne bi- vel trifurcata; caulis cortice brunneo parce puberulo obtectus; rami graciles, leviter flexuosi, straminei, puberuli. *Folia* sessilia, basi cuneata, ad medium vel fere ad medium digitatim 3–5-lobata, 1·5–2 cm. longa, 1–1·5 cm. lata, utrinque praesertim in nervis parce pubescentia, punctata, lobis lanceolatis acutis 2–3 mm. latis 1-nervis. *Capitula* heterogama, 2–4-corymbosa, terminalia, pedunculata, campanulata, 5 mm. longa, circiter 6 mm. diametro; pedunculi gracillimi, 1·5 cm. longi, minute puberuli. *Involucri* bracteae 4-seriatae, exteriores subulato-lanceolatae, acutae, interiores lineares vel oblanceolatae, subacutae, extra superne parce pubescentes. *Flores* ♀ pauci; corolla imperfecte 3-lobata. *Flores* ♂

numerosi; corollae tubus 2 mm. longus, angularis, in angulis glandulosus, 4-lobatus, lobis ovatis obtusis 0·75 mm. longis. *Achaenia* 1·5 mm. longa, minute papillosa.

Tropical Africa.—North-West Rhodesia: Choma, 1120 m. May, *Rogers* 8022.

7. **S. mollissimum,** *Hutchinson*, sp. nov.

S. heptalobum, S. Moore in Journ. Linn. Soc. xl. 117 (1911), non Oliv. et Hiern.

Herba lignosa, erecta; caulis superne ramosus, dense molliter tomentosus, subdense foliatus. *Folia* sessilia, breviter palmatim 3–5-lobata, ambitu obovata, 3–3·5 cm. longa, usque ad 2·5 cm. lata, utrinque praecipue in nervis tenuiter pubescentia, punctata, lobis oblongo-lanceolatis subacutis 4–8 mm. longis 3–4 mm. latis marginibus incrassatis leviter recurvatis. *Corymbi* parvi, ramos fere efoliatos terminantes; pedunculi ultimi 3–4 mm. longi, tomentelli. *Capitula* heterogama, turbinato-campanulata, circiter 5 mm. diametro. *Involucri* bracteae 4–5-seriatae, exteriores lineares, interiores lanceolatae, subacutae, usque ad 3 mm. longae, extra appresse pubescentes. *Flores* flavi, exteriores ♀, interiores ♂ ; corollae tubus florum ♀ 3- vel imperfecte 4-lobatus, florum ♂ 4-lobatus, tubo 1·5 mm. longo angulari in angulis glanduloso, lobis ovatis cucullatis extra glandulosis. *Achaenia* papilloso-glandulosa, 1 mm. longa.

Tropical Africa.—Rhodesia: near Chirinda, 1500 m., May, *Swynnerton* 491.

8. **S. dactyliferum,** *Hutchinson*, sp. nov.

S. heptalobum, Oliv. et Hiern in Oliv. Fl. Trop. Afr. iii. 399, quoad descript. et spec., excl. syn.

Herba lignosa, erecta, apice parce ramosa; caulis sulcatus, appresse puberulus. *Folia* sessilia, palmatim 3–5-lobata, ambitu elliptica vel obovata, 2–4 cm. longa, 2–3 cm. lata, utrinque puberula et punctulata, lobis linearibus vel lineari-lanceolatis subacutis 0·8–1·5 cm. longis 3·5–4 mm. latis 1-nervis. *Capitula* heterogama, dense corymbosa, breviter pedunculata, late campanulata, 8 mm. diametro; pedunculi robusti, 5–6 mm. longi, tomentelli. *Involucri* bracteae 4-seriatae, lanceolatae, plerumque acutae, usque ad 3·5 mm. longae, marginibus leviter membranaceis, extra appresse pubescentes. *Flores* exteriores ♀; corollae tubus breviter 2–3-lobatus, styli ramis breviter exsertis; corolla florum ♂ 4-lobata; tubus 1 mm. longus, glaber, lobis late obtusis 0·75 mm. longis. *Achaenia* appresse papilloso-pubescentia, 2 mm. longa.

Tropical Africa.—Portuguese East Africa: near Sena on the Zambesi, *Kirk*. North-West Rhodesia: Pemba, June, *Rogers* 8266.

9. **S. saxicola,** *Hutchinson*, sp. nov.

Tanacetum hippiaefolium, Drège, Zwei Pflanzengeogr. Docum. 152, non DC.

Herba lignosa usque ad 1 m. alta, e basi ramosa; rami angulares minute puberuli, dense foliati. *Folia* sessilia, ambitu obovata, pinnatipartita, utrinque puberula, 2·5–4 cm. longa, 2–3·5 cm. lata, lobis distantibus sinu lato formantibus oblongo-lanceolatis acutis

usque ad 1·5 cm. longis et 4 mm. latis 1-nervis marginibus parallelis. *Capitula* heterogama, laxe corymbosa, folia superiora multo superantia, pedunculata, turbinato-campanulata, 4 mm. longa, 5 mm. diametro; pedunculi ultimi graciles, 0·5–1 cm. longi, puberulo-tomentelli. *Involucri* bracteae 4-seriatae, ab extremo sensim longiores, usque ad 2·5 mm. longae, lineari-lanceolatae, exteriores acutae, interiores obtusae, extra appresse pubescentes, marginibus submembranaceis. *Flores* aurantiaici, exterioribus paucis ♀. *Florum* ♀ corollae brevissime 4-lobatae. ♂ 4-(rarius 5-) lobatae, extra superne parce glandulosae. *Achaenia* glabra, angularia.

South Africa.—Kalahari Region: Transvaal; Jeppes Town ridges, Johannesburg, 1930 m., Jan.–Feb., *Gilfillan in Herb. Galpin* 6218; Modderfontein, in the bush, *Conrath* 402; Houtbosh, *Rehmann* 6082.

Eastern Region: Transkei; Kentani district, small stiff herb bordering stones, 400 m., May, *Pegler* 1509. Pondoland; between Omsamwubo and Omsamcaba, rocky shady valley near the great Waterfall, below 320 m., May, *Drège*. East Griqualand: moist rocks around Clydesdale, 800 m., Mar., *Tyson* 2744; *Tyson in Herb. Bolus* 867. Natal; Inanda, *Medley Wood* 475; Durban, *Krauss* 149.

In herbaria this species has been associated with *S. heptalobum* (*Tanacetum heptalobum*, DC.), but it seems to be distinct as shown in the key. *S. saxicola* is always noted as growing amongst rocks, whilst *S. heptalobum* favours the banks of streams.

10. **S. heptalobum,** *Oliv. et Hiern* in Oliv. Fl. Trop. Afr. iii. 399 (1877) [quoad syn., excl. descr. et specim.].

Tanacetum heptalobum, DC. Prodr. vi. 133 (1837); Harv. in Harv. et Sond. Fl. Cap. iii. 167.

South Africa.—Kalahari Region: Transvaal; Mac Mac Creek, *Mudd*; between Sabie Falls and Pilgrims Rest, June, *Burtt Davy* 429.

Eastern Region: Pondoland; Umtata River banks, 760 m., Jan., *Kolbe & Pegler* 1599. Natal; between Umbomanzi River and Umlazi River, *Drège*; Dumisa, Alexandra distr., borders of forests, 580 m., Apr., *Rudatis* 949; Inanda, *Medley Wood* 1316; "Natal," *Gerrard* 434.

11. **S. hippiaefolium,** *Hutchinson*, comb. nov.
Tanacetum hippiaefolium, DC. Prodr. vi. 133 (1837).

South Africa.—Eastern Region: Stockenstrom; Katberg, May, *Shaw* 104, 107; 1100–1300 m., July, *Baur* 876. Griqualand East; on hills around Kokstad, 1400 m., June, *Tyson* 1377; 1700 m., *Tyson* 453. Natal; Weenen country, in a valley, 1300 m., Apr., *Medley Wood* 4452; "Natal," *Gerrard* 1959.

12. **S. oxylobum,** *S. Moore* in Journ. Linn. Soc. xl. 117 (1911).

Tropical Africa.—Rhodesia: Mt. Pene; Chimanimani Mts., Sept.–Oct., *Swynnerton* 1871; 6132.

XX.—A NEW CASE OF SYMBIOSIS BETWEEN A BACILLUS AND A PLANT.

(Preliminary Note.)

STUDIES FROM THE PATHOLOGICAL LABORATORY.

I.

DR. PETER GEORGEVITCH.

A new case of symbiosis between a bacillus and a plant has been found in *Kraussia floribunda*, Harv., which is cultivated in the Royal Botanic Gardens, Kew.

On the leaves of this plant there are many nodules, the anatomical structure of which is similar to that described for the nodules in the leaves of species of *Pavetta*. The nodules in *Kraussia* are elliptical, and attain a size of 350 μ by 150 μ They are separated from the tissue of the leaf by two or three layers of cells and above them the epidermis is slightly depressed.

The nodule is formed of spongy tissue with many intercellular spaces in which lives a bacillus whose morphology, formation of spores and germination are described in this note.

The bacillus is rodlike in form, 3 μ or 5 μ in height and 1 μ in thickness. It is not mobile and forms on agar (in 24 hours, at a temperature of 33° C.) colonies of 1 or 3 mm. in diameter which are white in colour and opalescent. Single rods prevail but not infrequently there are chains of three or more individuals.

When inoculated from nodules on to potatoes or potato agar the bacillus begins to divide in the following manner. In the middle of the bacillus there appear two similar chromatic granules opposite each other on the lateral walls. By deposition of new chromatic material around these granules towards the centre of the bacillus in a diaphragm-like manner the formation of a transverse wall is completed. This is deeply coloured by a dilute solution of Carbol-Fuchsin and by intra vitam staining (fig 1).

After the formation of the transverse wall the bacillus becomes attenuated in its middle region, whilst the transverse wall itself splits into two laminae. This splitting begins by the division of the two chromatic granules, from which the transverse wall originates and continues towards the middle of the bacillus until the whole transverse wall is divided into two lamellae (fig 3). This is proved by the fact that two smaller chromatic granules are always found on the edges of each lamella which form the transverse wall of the new bacilli (figs. 3, 4), whilst the primary transverse wall originates from only two chromatic granules (figs. 1, 2). The lateral walls of the parent bacillus split at the point between the two newly formed laminae of the transverse wall (fig. 3), and so the daughter bacilli become separated from each other (fig. 4).

The new bacilli formed in this way become more or less oval in form. In the protoplasm appears a chromatic granule which

stains very deeply and is situated either at the pole or laterally below it (figs. 5, 6). Later two chromatic granules are formed on the lateral walls of the bacillus (fig. 7), and by deposition of chromatic material about these, the formation of a transverse wall is completed. By further deposition of chromatic material about these granules towards the pole of the bacillus (fig. 8) a vesicle of chromatin is formed, by which a mass of protoplasm is separated from the remaining content. This is situated close to the pole of the bacillus (fig. 9), and stains very deeply with dilute Carbol-Fuchsin. The vesicle elongates in the direction of the longer axis of the bacillus and becomes rodshaped (fig. 10) and growth continues until the whole interior of the bacillus is occupied (fig. 11). In this stage the rod is not stained by Carbol-Fuchsin, but is highly refractive and is yellowish-green in colour.

The spore of the bacillus formed in this manner is liberated by the splitting of the lateral wall of the sporangium (fig. 12), which opening, becomes sufficiently wide to allow of the escape of the spore (fig. 13).

In older cultures these free spores prevail and are 2–3 μ in length and 1·5–2 μ in width. To these adhere the remains of the split sporangia forming a mass which colours deeply with Carbol-Fuchsin, while the spores themselves do not colour with this stain.

The wall of the germinating spore takes Carbol-Fuchsin very deeply, while its protoplasm is coloured only pale red.

In the middle of a germinating spore a chromatic granule is formed which is coloured very deeply with Carbol-Fuchsin (fig. 14), and as a result of further development two chromatic granules are laid down on the lateral walls (fig. 15). By deposition of new chromatic material about these granules towards the middle of the spores a transverse wall is formed (fig. 16), and by further deposition of chromatic material about the same granules in the direction of the pole of the spore a vesicle is produced (fig. 17).

This vesicle, which represents the embryo, grows towards the middle of the spore and in consequence of its further development, the wall of the spore splits (fig. 19), the opening becomes wider and the vesicle which now stains deeply, emerges (fig. 20).

At this stage of development there are in cultures a great number of empty spore-walls which always show the opening through which the embryo has emerged (fig. 21).

XXI.—MISCELLANEOUS NOTES.

Mr. A. Sharples.—We learn that Mr. A. Sharples, Assistant Mycologist in the Agricultural Department of the Federated Malay States, has been appointed Mycologist of the Department, with effect from 10th January, 1916.

Botanical Magazine for May.—The plants figured are *Rhododendron decorum*, Franch. (t. 8659), from Western China; *Penstemon rupicola*, Howell (t. 8660), from North America; *Cytisus ratisbonensis*, Schaeff. (t. 8661), which occurs from Central Europe to Siberia, and *Eria tomentosa*, Hook. f., a native of Indo-China.

Phoenix canariensis.—This palm has been known for many years, notably on the Riviera, for its ornamental qualities. It was described as *P. dactylifera*, var. *Jubae*, by Webb and Berthelot (Hist. Canar. iii. Phytog. iii. 289, 1845-8), who gave a reference to it in Pliny's History under the name of *Palmeta caryotas ferentia*. As a cultvated plant it was mentioned as *P. caryotas*, Hort., in Verschaffelt's Catalogue for 1869, 13, and did not receive the name of *P. canariensis*, Hort., until 1882. It has proved hardy at Montevideo, and in California it is planted by the sides of roads, where it has superseded *P. reclinata*, Jacq. The following is its synonomy:—

P. canariensis, Hort. ex Chaubaud in La Provence Agric. No. 19, 293, figs. 66-68 (Oct. 1882); Becc. in Malesia, iii. 347, 369, t. 43, fig. 2; Rev. Hort. 1885, 541, 1888, 180, and 1893, 126, figs. 46 and 49; Ill. Hort. xxxiii. 8; Le Jardin, 1887, 67, fig. 26: Gard. Chron. 1894, xv. 405, fig. 50, and 1902, xxxii. 81, with fig.: Rev. Hort. Belg. 1911, 332. *P. dactylifera*, var. *Jubae*, Webb & Berth. Hist. Canar. iii. Phyt. iii. 289. *P. tenuis*, Hort. ex Verschaff. Catal. 1869, 13, with fig. *P. Vigieri*, Hort. ex Rev. Hort. 1888, 180. *P. Jubae*, Christ in Engl. Bot. Jahrb. vi. 469. and ix. 170.

This species can be separated from its allies thus:—

Female corolla twice as long as the calyx: Suckers present. Fruit cylindrical; pericarp fleshy and sugary	*P. dactylifera*, Linn.
Stem solitary. Fruit oblong-elliptic; pericarp scarcely fleshy	*P. sylvestris*, Roxb.
Female corolla scarcely longer than the calyx. Stem solitary, very thick. Fruit globose-ovoid; pericarp scarcely fleshy	*P. canariensis*, Hort.

A hybrid has been raised between the last two. In addition to the ornamental value of this palm, Dr. G. V. Perez, of Tenerife, has in a recent letter made the following comments upon its uses:—

(1) Probably the best windbreak for plantations known, and

one of the few which will successfully stand sea-winds, and a considerable amount of salt in the soil.

(2) An ideal tree to plant along river banks, to avoid erosion of the soil.

(3) The hard kernels are admitted in this very village [Santa Ursula] to be one of the best and most fattening foods for pigs; it is also well known to be relished by goats, and neither of these two animals seems to mind in the very least the great hardness of the kernels: some years ago I fattened a turkey most successfully on these dates, or kernels, as they are practically all kernels with little more than skin over them. Dr. Perez mentions that he is at present feeding a milch cow with the kernels after steeping them in water for a few days.

(4) The inhabitants of Gomera make a wonderful use of the Canary Palm by carefully tapping its sap and making a most valued and abundant beverage, also a sort of honey, which all prove the great richness in saccharine substance of our palm.

According to the historian of the Islands, Don José de Viera, y Clavijo, a single palm yields a barrel of palm honey, this being the concentrated syrup obtained by heating the palm sap.

Don Pedro del Castillo, who wrote his history of the Islands in 1706, states that the Guanches (Aborigines) of Gomera, before the Spanish conquest of the islands, were in the habit of tapping the thousands of palms in that island. If this be true it would appear to confirm the belief that the Guanches introduced the practice from the opposite coast of Africa, where the tapping of palms is largely practised, and either therefore the Guanches came originally from Africa or the custom was introduced thence.

Dr. Perez adds that in the island of Gomera, which is famous among other things for the fact of Columbus having lived in it for a long time before he discovered the New World, palms have been from time immemorial an object of economic exploit. The genuine date palm, Dr. Perez suspects, must have been imported from the neighbouring oasis by the frequent raids which the first Spanish Lords of the island were well known to have made into the facing coast of Morocco, when there was even a fort under their rule (Santa Cruz de "Mar Pequeña").

In these numerous raids they brought back the famous Atlas Stag which, till a century ago, was a well-known object in the virgin forests of Gomera, the red-legged partridge, unknown in the islands before the raids of the Spanish Lords, and also the splendid Arab ponies which till quite lately were the admiration of all travellers who visited Gomera.

A Method of Macerating Fibres.—It is necessary when examining vegetable fibres to be able to isolate the component elements of the fibrous strands, *i.e.*, to macerate the material. After maceration the measurements and other characters of the individual elements can be easily determined.

There are several methods of macerating plant-tissues. One of these often employed in botanical laboratories, *e.g.*, for studying

the structure of wood, depends on the use of nitric acid and chlorate of potash (Schulze's macerating mixture). This reagent can be used for fibres, but its action is slow unless heat is applied, and in the latter case the acid fumes given off are a drawback to the method.

Among other reagents which have been recommended for macerating fibres are solutions of caustic potash and chromic acid, the material being either boiled in the potash solution or soaked in cold chromic acid solution. Different details of treatment are given by different writers as regards the strength of the solutions to be used and the time requisite for maceration.*

As a strong solution is normally more energetic in action than a weak one, maceration is more rapid in the former. Though convenient in causing quick maceration, a strong solution has the disadvantage that its action may readily become too general. Thus, if concentrated chromic acid be used, the removal of the middle lamellas (which causes maceration of the specimen) may not be completed before the other parts of the cell-walls begin to be attacked.† In such cases portions of the walls may be dissolved away, or the fibres may all become very fragile. With potash solution too severe treatment may cause considerable swelling of the cell-walls.

A convenient method thus requires the use of a reagent which is strong enough to be fairly quick in producing maceration without causing appreciable alteration in the isolated fibrous elements. These requirements are not easily fulfilled. Since some fibres are decidedly more resistant to maceration than others, a uniform strength of reagent and time of treatment cannot be expected to be successful in all cases. As a regular procedure, however, a generally efficient strength of solution may be adopted, and some of the fibre-material may be examined at intervals during maceration, so that the treatment may be stopped at the right time.

In experimenting with some modifications of the usual methods it was found that a combination of the use of potash and of chromic acid has advantages in the ease with which a good result is generally obtained. The method therefore appears to be worth describing.

The reagents used are a 10 per cent. aqueous solution of caustic potash, and a solution of chromic acid made by adding one part of a saturated watery solution of chromic acid to four parts of water.‡ A small amount of the fibre is first boiled for about four minutes in the potash solution§, then rinsed in water, and afterwards soaked in the chromic acid for five or ten minutes. The fibre may by that time be sufficiently macerated. If so, it is found to be limp, and may be gently transferred to a vessel of

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* See Herzog, Microphot. Atlas d. technisch wichtigen Faserstoffe (1908). p. 16, and other works on fibres referred to by Herzog on p. 41.

† Material to be treated, if not already in the form of hair-like strands, should be sliced into rather thin strips.

‡ In some experiments one part of saturated chromic solution to three of water was used, and worked satisfactorily. It is perhaps better however to employ the weaker solution and strengthen it if necessary.

§ Certain kinds of fibres are satisfactorily macerated by this treatment with potash alone, and do not require the chromic acid.

water, in which it is left for a short time to remove the chromic acid. It is then placed in a test-tube half-full of water and shaken up with some vigour, after which as a rule the constituent elements will be found to be completely separated.

If the material has not become sufficiently limp after ten minutes in the chromic acid, the solution may be strengthened by adding a little saturated solution to it, and the fibre may be tested again for softness a few minutes later.

Several samples of commercial fibres were treated by the method described above, and proved to be well macerated either after five or ten minutes in the chromic acid, or after a few additional minutes in a slightly stronger solution. In this treatment it was not found that the walls of the fibres were either swollen by the potash or attached by the chromic acid.*

For certain classes of fibres it would no doubt be better to use a somewhat different treatment, but the above method appears, after a number of trials, to be suitable for fairly general use with fibres. When in any case it is found that the action has been too weak or too strong, it is easy to alter the treatment in the right direction for a second attempt.

Maceration of wood was tried by the same method, but the results were much less satisfactory than those obtained with fibres.

L. A. B.

Tulipa Wilsoniana.—A case of polyphylly has occurred in *Tulipa Wilsoniana*, Hoog., grown at Kew, two flowers of which have become regularly tetramerous. The perianth consisted of eight segments arranged in two whorls, in each of which two were external in bud, while those alternating with them were inside, thus resembling the aestivation of *Papaveraceae*. In one flower the segments were quite regular, but in the other larger one there was a slight irregularity in their size combined with a tendency to become lobed along their sides. The eight stamens were all perfect. The four stigmas in one flower diverged at equal angles, but in the other two of the rays were slightly nearer together than the remainder. The ovary was completely four-celled with two rows of perfect ovules in each cell. The typical plant, which comes from the south-west of Aschabad and is named after the late Mr. G. F. Wilson, has been figured in the Gardeners' Chronicle, 1901, vol. xxix., p. 327, fig. 121, and in the Revue Horticole, 1903, p. 206.

C. H. W.

Potato Disease Investigations.—A paper of considerable importance to those interested in potato diseases has recently been published by Dr. G. H. Pethybridge. The paper is the outcome of an investigation—extending over six years—of the potato disease caused by the fungus *Verticillium albo-atrum*, R. & B. The work has been carried out, partly at the experiment

* Except that in one or two cases the fibres had become somewhat brittle. They were then liable to break across if shaken up with a good deal of energy.

station at Clifden, Co. Galway, which during its short existence has contributed so much to our knowledge of potato diseases, and partly in Dublin.

The *Verticillium* potato disease was described by Reinke and Berthold as long ago as 1879, and was stated by them to be the cause of the well-known malady of potatoes known as "Leaf Curl." Since then many workers have investigated the "Leaf Curl" problem, and a mass of literature has accumulated which is, however, of a most confusing and conflicting nature. The various writers have attributed utterly different fungi as being the cause of "Curl" and the allied "Leaf Roll" (in England *Macrosporium Solani* was usually considered mainly responsible), while others vigorously maintained that the disease was non-parasitic, and due to physiological disturbances in the plant.

Dr. Pethybridge's prolonged and careful study of *Verticillium albo-atrum* is of special value in showing exactly what the fungus is usually responsible for, and, further, what it is capable of accomplishing. It is, moreover, the first detailed study of a "Curl" disease in the British Isles. Pethybridge finds that, in the main, Reinke and Berthold were correct, but shows that "curl" is not by any means a constant feature of the *Verticillium* disease. He also corrects several errors made by them, and shows how the difficulties and discrepancies they encountered may be explained.

The mycelium of the fungus is found in the vascular bundles only, and it is confined in them to the wood vessels. With the sprouting of the tuber the mycelium passes along the vessels into the new shoots, though sometimes not until the latter have made considerable growth. Hence though the potato plants may often show the typical symptoms of *Verticillium*, no mycelium will be found in the stem, except at the extreme base. In later stages the mycelium may advance up the shoots and be traced in the vessels of the petioles and leaves, though in cases of bad infection the water-conducting tissues become so blocked that the plants wither and die off early in the season.

From the base of the shoots the mycelium also passes into the wood vessels of the rhizomes and from these into the new tubers. Pethybridge's experiments show that, contrary to the view held by Reinke and Berthold, the mycelium, even in the autumn, penetrates well towards the rose-end of the tubers and that during winter it advances further, a discovery which obviously renders control less easy than was previously thought. He also states that no reliance can be placed on the absence of a dark ring in the tuber as a proof of clean seed.

The fungus grows well in pure culture as a saprophyte, and infection experiments on healthy plants carried out with pure cultures were successful in reproducing the disease. In the field infection is without doubt carried on by the tubers, and it is not known how primary infection might occur under natural conditions. For controlling the disease clean "seed" is, of course, essential.

An attack of *Verticillium albo-atrum* results in the more or less premature death by desiccation of the plant owing to the choking

up of the wood vessels with mycelium. For this reason Pethybridge regards it as a type of wilt disease, though the wilting of the foliage is rare in Ireland, and he suggests that it should be removed from the category of "Curl" and "Roll" diseases, and be regarded as a type characterised by the wood vessels being infested by mycelium, for which he suggests the term *hadromycosis*.

Much still remains to be learned as to the other sources of Leaf Curl and Leaf Roll, but it is highly satisfactory to have a full and careful account of Reinke and Berthold's *Verticillium* disease which has hitherto received very scant attention in the British Isles.

A. D. C.

Plants in Health and Disease.—A small work under the title "Plants in Health and Disease" has recently been issued by the Manchester University Press. The volume represents an abstract of a course of lectures designed especially for small gardeners and allotment holders, and delivered at Manchester University during 1915–1916.*

The first seven lectures were given by Prof. F. E. Weiss, and deal with the structure and life of plants in normal health. The last ten, five each by Mr. W. Robinson and Dr. A. D. Imms, deal with diseases of plants caused by fungi and animals respectively.

As is emphasised in the introduction it is clearly impossible within the scope of seventeen lectures to deal in any but the briefest way with any of the subjects chosen, but, in spite of this, the size of the audiences and the interest aroused appeared to warrant the publication of the weekly abstracts in book form.

The lectures are simply and clearly worded, and not burdened with technical terms. In those on disease a few important types are selected and described. They deal especially with animal and fungous pests found in the Manchester neighbourhood, and hence, though applicable to gardens in any industrial area, are perhaps more specially suitable for readers in the north of Britain.

A. D. C.

---

* The University Press, Manchester, 1916. Longmans, Green & Co. 8vo. pp. 143. Price 1s. 6d.

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ROYAL BOTANIC GARDENS, KEW.

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OF

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No. 5] [1916.

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ROYAL BOTANIC GARDENS, KEW.

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OF

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No. 5] [1916

XXII.—A PHOMA DISEASE OF LAVENDER.

STUDIES FROM THE PATHOLOGICAL LABORATORY: II.

WILLIAM B. BRIERLEY.

(With Plates.)

In the early summer of 1915 my attention was drawn to two large beds of *Lavandula officinalis* in which practically every plant was dying. Affected shoots presented a dry, dirty brownish-grey colour, and the epidermis tended to split away in minute silvery flakes. The leaves on a diseased stem preserved their normal appearance for some time and then somewhat rapidly wilted and became brown and shrivelled. All portions of the plant above the dry discoloured areas died. This is a not uncommon disease of lavender, and at times is the cause of serious loss to growers. At first individual shoots only are affected but finally the complete plant is involved, and in a bed the disease rapidly spreads until all the plants are in a weak or dying condition.

A careful examination of a diseased shoot showed that the shrivelled portion of the stem under the flaking epidermis was studded with very minute blackish-brown points which proved to be the pycnidia of a fungus ramifying in the tissues. This fungus was identified as *Phoma lavandulae*, Gabotto, a species hitherto unrecorded in England.

The only other determination of this fungus is that of its original discoverer, who gives the following description of it.

Phoma lavandulae, nov. sp.

"Picnidiis corticalibus, solitaris, lenticularibus, prominulis atris. Basidiis hyalinis, acicularibus 12–14 μ long. Sporulis fusoideis, 2-guttulatis, hyalinis, 4-2 μ."

"In ramis Siccis Lavandulae officinalis Chaix. Mirabello in Pedem."*

As this description represented our knowledge of the fungus, no figures having been published, and as the fungus was sus-

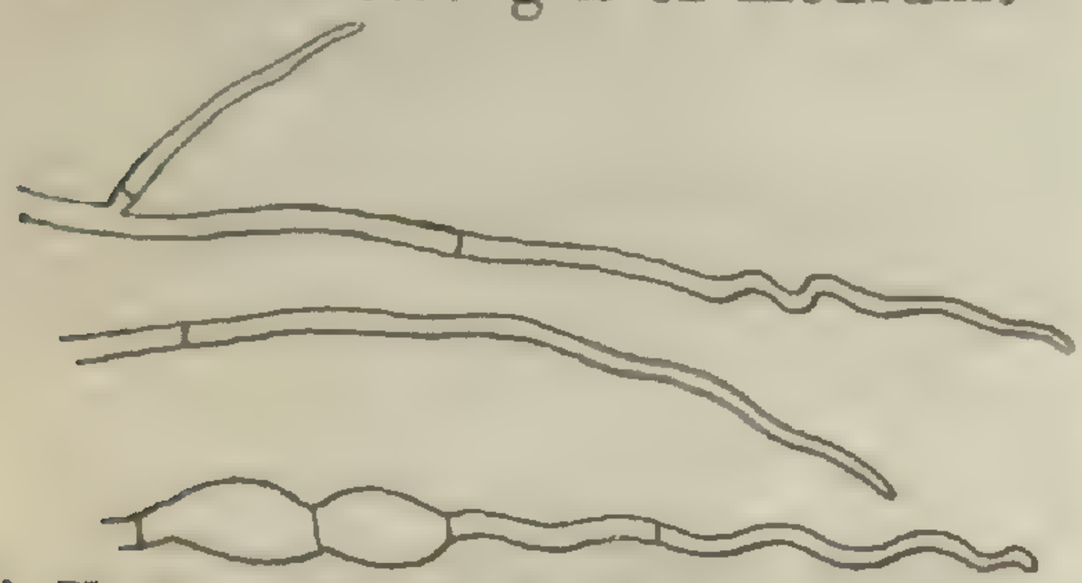
* Dottore L. Gabotto. Contribuzione alla Flora Micologica Pedemontana. Nuovo Giorn. Bot. Ital., vol. xii., p. 69. 1905.

(4427.) Wt. 74-728. 1,125. 6/16. J. T. & S., Ltd. G. 14.

pected of pathogenic qualities, it was considered advisable to make a more detailed investigation of its morphology and biological relationships.

Life History of the Fungus in pure culture.

The pycnospores usually germinate in a period of from one to three or four hours on nutrient media at room temperature (approximately 14–16° C.), and a moderate mycelial growth occurs. At first this is pure white but with increasing age becomes slightly grey. The medium directly beneath the colony is coloured brownish-red or variously from this to a dirty grey, the coloration not being constant for any particular nutrient medium or strength of medium.



1. Undulate terminal cells from mycelium growing on potato gelatine. (Swift $\frac{1}{6}$ obj. × III. eyepiece.)

The superficial hyphae are hyaline and septate; and smooth and regular with the exception of the terminal cell which is frequently undulate. (*Text Fig.* 1.)

The cells are uninucleate and the transverse walls are formed by the ingrowth of a ring-like diaphragm of cell wall substance. (*Pl.* V. *Fig.* 1.) The cell nucleus contains one or very rarely two nucleoli, and occasional granules which stain with nuclear stains. Fat is present in the vacuoles of the cytoplasm and not infrequently there is distinct evidence of glycogen. The cell walls stain dull yellow with Schultze's chlor-zinc-iodine solution.

The mycelium penetrates the nutrient medium to a depth of from five to eight millimetres, and the submersed hyphae are often very irregular with nodulose, barrel-shaped or globular cells. (*Text Fig.* 2.)

2. Irregular forms of submersed hyphae from various media. (Swift $\frac{1}{6}$ obj. × III. eyepiece.)

When growing on a nutrient liquid such as aqueous extract of fresh lavender shoots, the character of the submersed hyphae is maintained although not in so exaggerated a form.

After a few days' growth the superficial hyphae begin to abstrict conidia, which at first are hyaline and thin-walled, but later become thick-walled and dark brown in colour.

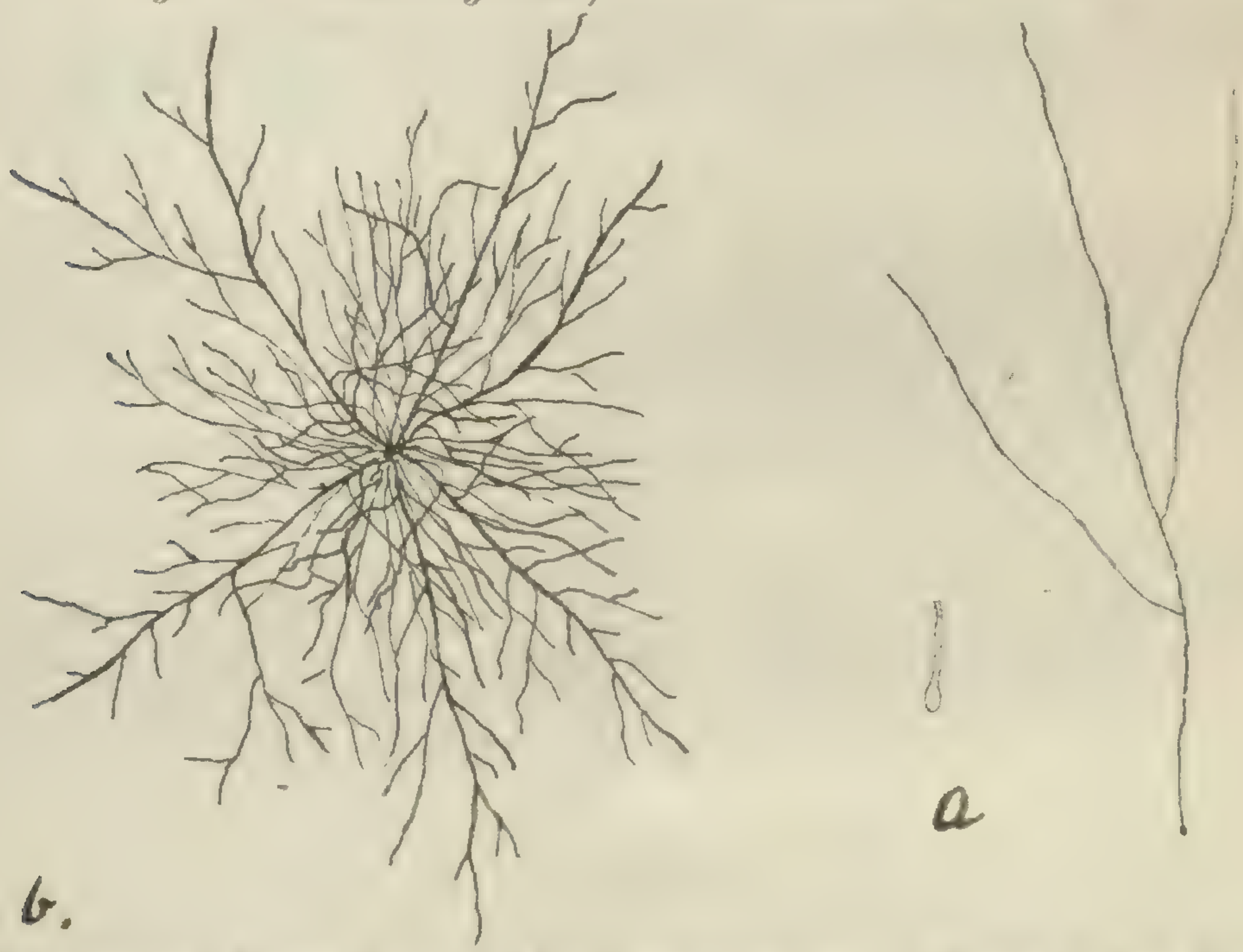
In about 14 to 17 days pycnidial formation occurs.

Under unusual conditions or with age the cells of the hyphae enlarge, become thick-walled and brown and very easily separate forming chlamydospores.

The fungus grows best at a temperature of about 18–20° C.

Pycnospores,—The pycnospores are hyaline, fusoid in shape, and frequently contain one or two vacuoles. (*Pl.* VI. *Fig.* 1.) Their average measurement is 4 × 2 μ, but very often spores of 5 μ and occasionally of 6 μ in length may be found. Their walls stain bluish with Schultze's chlor-zinc-iodine solution and the contents appear to consist largely of glycogen.

The germ tube may be protruded from the side or from the end in which case the spore appears merely to elongate into a hypha. (*Pl.* VI. *Fig.* 1. *Text Fig.* 3*a*.).



3*a*. Pycnospore fifteen hours after germination. Spore more highly magnified at the left side. (Swift $\frac{1}{6}$ obj. × I. eyepiece.)

3*b*. The same colony after three days' growth. Note the main lines of hyphae, which perhaps correspond to the distributive hyphae when the fungus is growing on its host. Spores in a hanging drop of lavender extract in a Van Tieghem cell at room temperature. (Swift $\frac{2}{3}$ obj. × I. eyepiece.)

The direction of the germ tubes is quite indiscriminate and does not appear to be conditioned either by the incidence of light rays or the local proximity of nutrient matter.

In distilled water very slender unbranched germ tubes were produced which never developed to a greater length than 35 μ. In tap water slender feebly branching germ tubes were protruded, growing to about 150 μ in length. In bouillon few spores germinated and the feeble germ tubes produced did not exceed 95 μ

in length. The spores very frequently became swollen and irregular. In the majority of aqueous plant extracts, or these with agar and gelatine, germination freely occurred, and a moderate but never luxuriant growth resulted. (*Text Fig.* 3*b*.)

In pure nitrogen-free media such as glucose or levulose, germination was delayed, and was then only very feeble, the germ tube rarely exceeding 20–25 μ. Normal germination was brought about by the addition of nitrogen containing compounds such as ammonium tartrate, peptone or asparagine, but not potassium nitrate nor ammonium chloride.

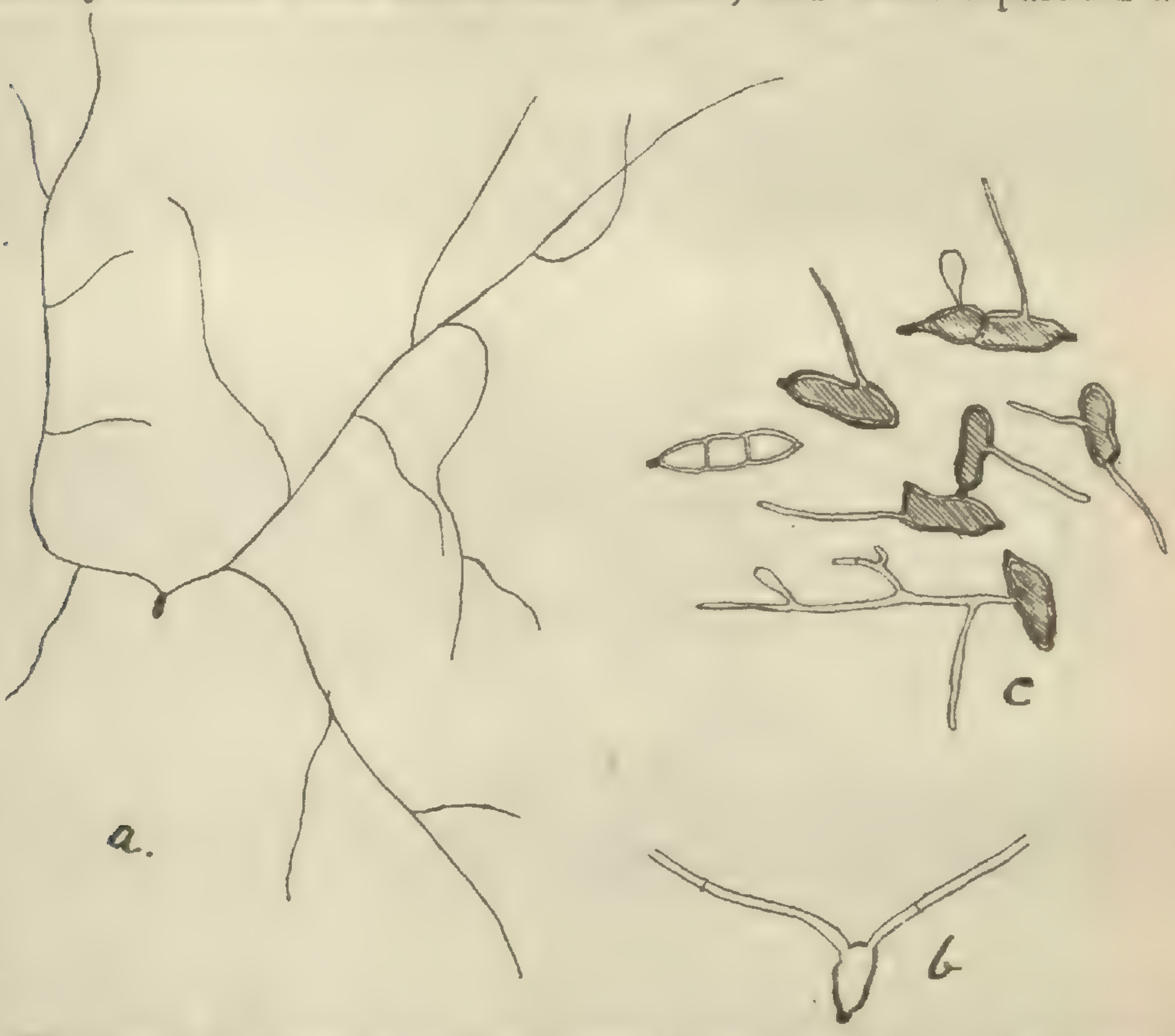
Centrifugalisation for ten minutes had no visible effect on the spores. After fifteen minutes a slightly decreased power of germination was noticeable and after twenty-five to thirty-five minutes' treatment not more than one half the spores were capable of producing germ tubes. The inhibited spores stained an unusually dark brown colour with Schultze's chlor-zinc-iodine solution, but otherwise no difference could be detected.

A few observations were made on the effect of various chemical fumes on the germinative capacity of spores air dried from a suspension in water on a cover slip. In each case the latter was inverted over the mouth of the bottle containing the liquid for three minutes, exposed to the air for five minutes and then a drop of aqueous extract of lavender shoots placed over the spores and the cover slip inverted over a Van Tieghem cell and kept in the dark at room temperature. After exposure to formalin, toluene, benzole, ammonia and ether, no germination occurred. Chloroform and creosote killed a large number of the spores and the remainder only produced feeble germ-tubes. Acetone and turpentine appeared to retard and enfeeble the germination of only a small proportion of the spores.

The pycnospores when in the pycnidium are very much more resistant to all adverse conditions than when in suspension in water or air dried upon a glass slide, and pycnidia on a shoot left exposed throughout the winter still contained a very few germinable pycnospores on March 3rd.

Conidia.—After a few days' growth in pure culture on a nutrient medium conidial formation occurs. Any of the aerial hyphae may give origin to conidia but their production is chiefly from erect rather short hyphae four to eight cells in length, which are rather more stout than the remaining aerial mycelium. (*Pl.* VI. *Fig.* 2.) The first conidium is usually budded off from the end of the terminal cell, but very soon other conidia are abstricted indiscriminately from any portion of any cell towards the tip of the filament. Very frequently a conidium while still attached to the conidiophore gives origin, often from its side, to other conidia. The conidia may be somewhat irregular in shape, but are chiefly fusoid and a distinct neck is to be found at the point of abstriction. (*Pl.* VI. *Figs.* 2, 3.) They are commonly unicellular and uninuclear, but occasionally a spore consisting of two or three cells may be seen. (*Text Fig.* 4*c*.) When first formed they are hyaline and thin-walled and remain in this condition for some time, especially if they become free from the conidiophore.

Finally their walls thicken and become dark brown or brownish-grey. Ultimately the cells of the conidiophore itself not infrequently become thick-walled and brown, and when separated are



4*a*. Thick-walled brown conidium twenty-four hours after germination (Swift $\frac{1}{6}$ obj. × I. eyepiece.)
4*b*. Spore of same. (Swift $\frac{1}{8}$ obj. × I. eyepiece.)
4*c*. Thick-walled brown conidia five hours after germination. Note the multi-cellular conidia. (Swift $\frac{1}{8}$ obj. × I. eyepiece.)

The spores had all been subjected to a temperature below zero and then placed in a hanging drop of lavender extract in a Van Tieghem cell and left at room temperature. The conidia were from a culture on potato gelatine.

hardly to be distinguished from the brown conidia in appearance and germinative capacity.

Usually one, and rarely more than two, germ tubes are protruded from any portion of the spore and the growth is stouter and more frequently branched than that described for the pycnospores. (*Text Figs. 4a, b, c.*) The conidia measure 12–20 μ by 3–6 μ.

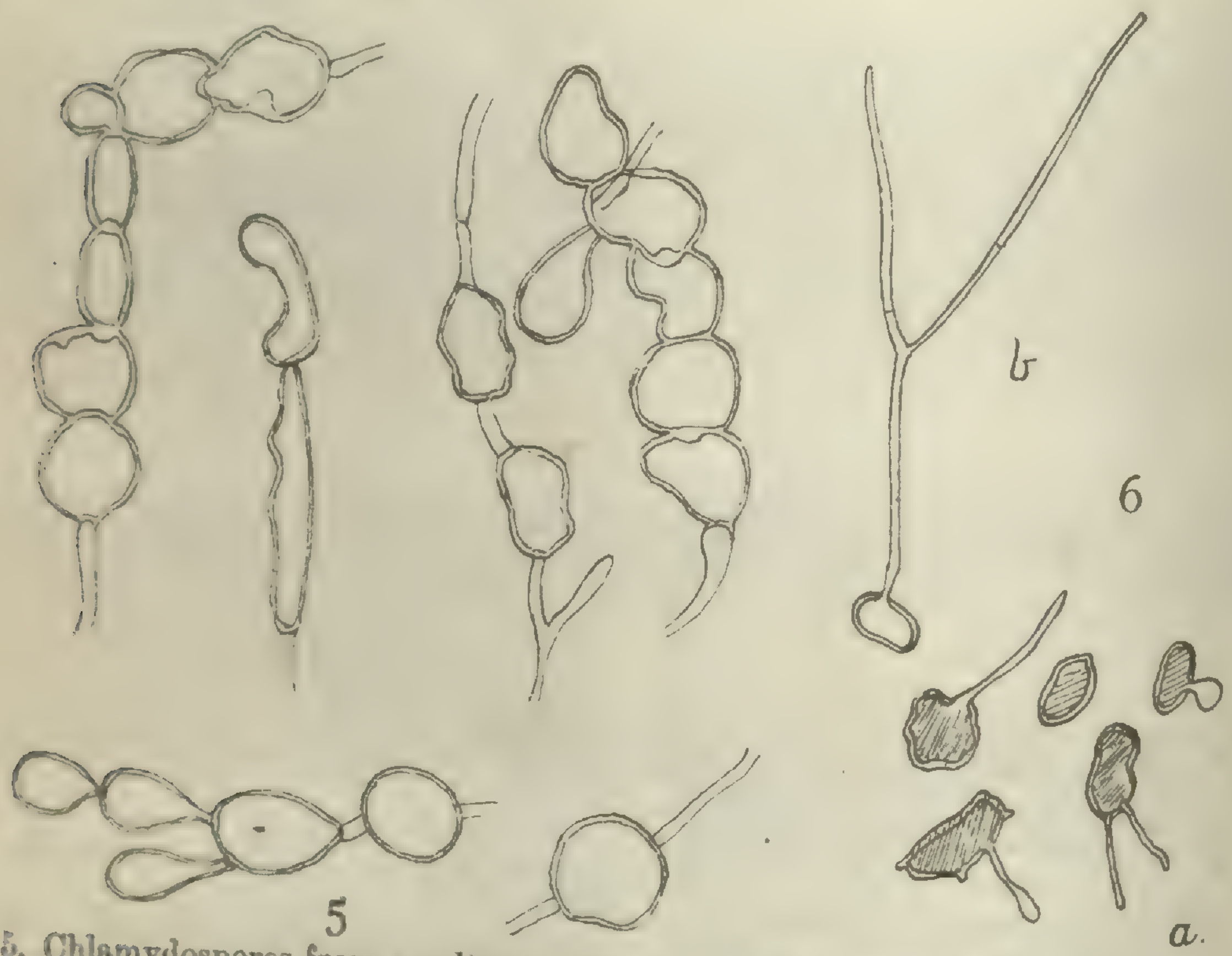
Hyaline Conidia.—The hyaline conidia approximate very closely to the pycnospores in their germinative capacity, but are perhaps slightly more resistant to adverse conditions.

Their walls stain yellowish-brown with Schultze's chlor-zinc-iodine solution and their contents consist largely of glycogen.

Thick-walled brown Conidia.—In water and nutrient media these spores do not germinate under a period of at least twenty-five days. This resting period may be curtailed or even eliminated by subjecting the spores to a temperature below freezing point or to the action of artificial gastric or pancreatic juice. The spores are equally susceptible with the pycnospores

to the influence of centrifugalisation, but much more resistant to desiccation and the action of chemical fumes. When the resting period of the spores has been eliminated their resistant quality is very greatly reduced.

Chlamydospores.—If the fungus be grown on a very stiff agar medium (*e.g.*, 5 per cent. potato agar), the colonies seldom attain a diameter of more than two centimetres, and after ten or twelve days' growth the mycelium breaks up into chlamydospores. (*Text Figs.* 5, 6.)



5. Chlamydospores from a culture on 4 per cent. lavender agar.
6*a*. Chlamydospores five hours after germination.
6*b*. Chlamydospore fifteen hours after germination.
The chlamydospores were from an old culture on prune gelatine. They were subjected to the action of trypsin in a faintly alkaline medium for three hours, washed and placed in a hanging drop of lavender extract in a Van Tieghem cell, and left at room temperature.
(All figs. Swift $\frac{1}{6}$ obj. × III. eyepiece.)

The cells become irregularly swollen, spindle-shaped, barrel-shaped, or even globular. Their walls become thickened, often very irregularly, and their colour changes to brown. The mycelium becomes brittle and easily disintegrates. This form of sporulation tends to occur on all media when the culture is old or growing under unfavourable conditions. The chlamydospores germinate in water and the majority of nutrient media, but only after a minimum period of twenty-one days and a usual period of twenty-five to thirty days. As in the case of the thick-walled brown conidia, this resting period may be eliminated by freezing or the action of gastric or pancreatic juice. In resistant quality to adverse conditions the chlamydospores approximate to the thick-walled brown conidia.

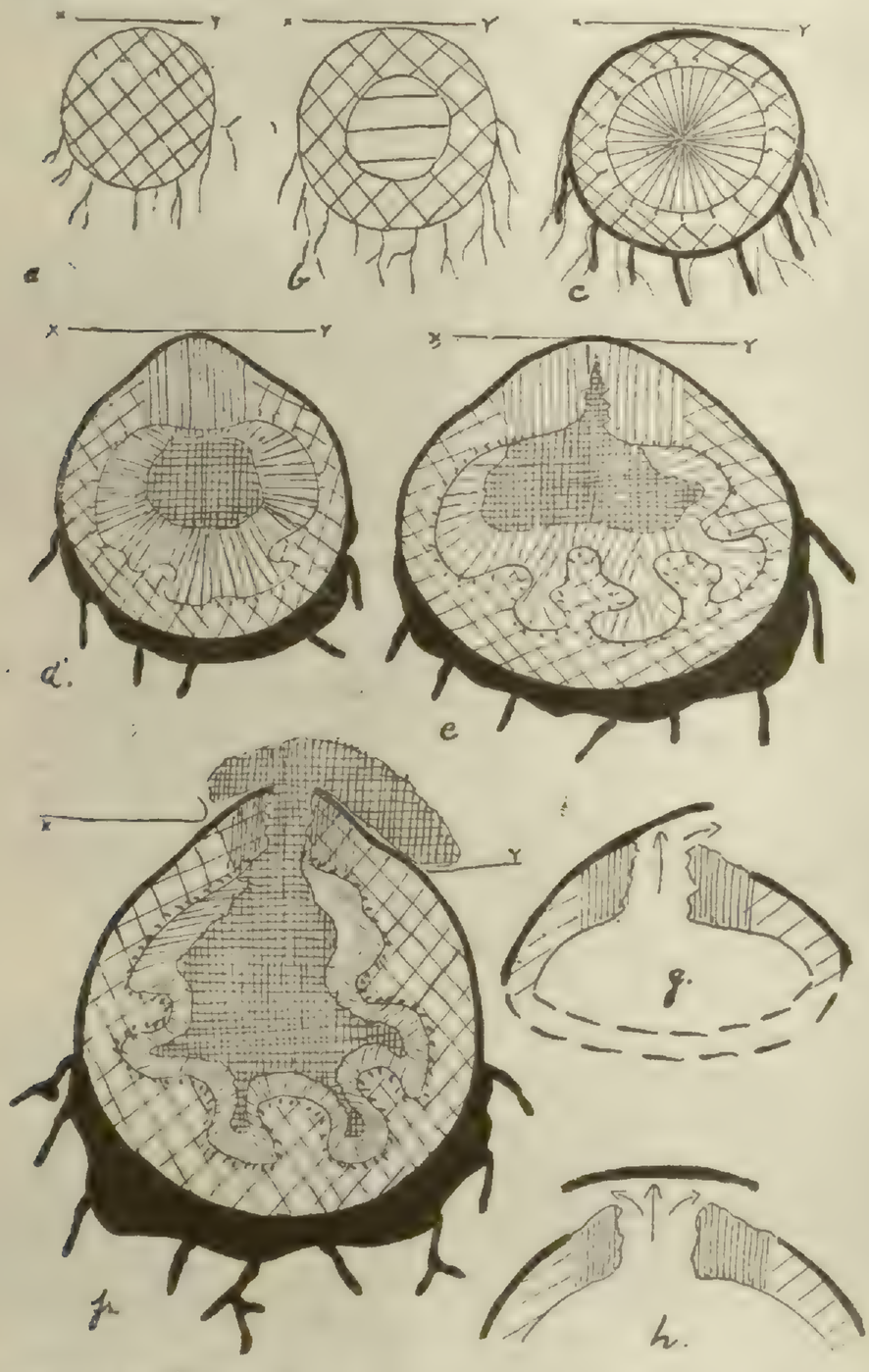
Formation of Pycnidia.—Pycnidial formation, although abundant on diseased plants, is only sparingly and inconstantly

found when the fungus is grown in pure culture on a nutrient medium. No attempt was made to elucidate the cytology of the process of development. The pycnidia originate as small knots or tangles of hyphae.—(*Pl.* V., *Figs.* 2, 3, 4)—the separate strands interweaving very intimately to form a compact mass. This increases in size, the hyphae become abundantly septate, and those on the periphery become slightly thick-walled and assume a brownish-black coloration. (*Text Fig.* 7*c*.)

The inner tissues are very delicate and show a radiate arrangement which is demarcated from a wall tissue. (*Text Figs.* 7*b*, *c*.)

The central portion of this delicate tissue is very finely divided. For some considerable time the pycnidium is without orientation and there is no indication of the point at which the ostiole will be formed. When about one-half to two-thirds grown, a portion of the wall tissue of the pycnidium develops rather more rapidly than the remainder and bulges internally and externally. (*Text Fig.* 7*d*. *Pl.* V., *Fig.* 5.) The pycnidia grow immediately below the surface of the medium, only the merest film of the nutrient matter covering them, and the swollen portion of the wall is found immediately below this film—*i.e.*, remote from the mass of substratum. This swelling is covered externally by the carbonaceous layer of peripheral tissue which encloses the pycnidium, but the tissue of the swollen portion of the wall is delicate, this being most marked in its central portion. The formation of this swelling is the first visible sign of orientation in the pycnidium, and marks the position of the future ostiole. About this stage of development the basal portion of the wall of the pycnidium begins to increase in thickness and hyphae grow out from the wall into the surrounding medium, so that not infrequently the pycnidium appears to be seated on a small stroma or basal pad of tissue. (*Text Fig.* 7*c*, *d*, *e*, *f*.) At the same time folds of the wall grow into the central tissues. The wall is clearly divided into a peripheral irregular carbonaceous layer, one to three or four cells thick, a middle pseudoparenchymatous tissue four to six cells in thickness, and an inner very delicate hymenial lining from which spring the basidia. (*Pl.* V., *Fig.* 5. *Pl.* VI., *Figs.* 4, 5.) These have exceedingly delicate walls and are turgid, with a dense very finely granular protoplasm. The centre is filled with a dense mass of turgid hyaline very minute cells, forming the extremities of the basidia and being the first pycnospores. The actual formation of the ostiole—(*Text Fig.* 7*f*)—is brought about partially by the disintegration or possible autolysis of the very delicate central cells of the "ostiolar tissue" and partly by the pressure exerted by the internal elements, which on the rupture of the ostiole pour forth in a diffuse mass. The peripheral layer of thick-walled brown cells originally covering the ostiole is either torn completely free—(*Text Fig.* 7*h*)—ruptured—(*Text Fig.* 7*f*., *Pl.* II., *Fig.* 4)—or pushed over to one side—(*Text Fig.* 7*g*). Pycnospore formation continues for some considerable time after the first rupture of the ostiole. Not infrequently two or three pycnidia in immediate contiguity fuse

together during their early stages of development and the walls separating them are absorbed into the central sporogenous tissues. When mature the irregular fruit may dehisce by one central ostiole or each loculus may possess its own opening. The development of the pycnidium is diagrammatically represented in Text figure 7.



7. Diagrammatic representation of the development of the pycnidium. The line X—Y represents the surface of the culture medium or epidermis of the host.

a. Undifferentiated pseudoparenchymatous mass of mycelium.

b. The central tissues demarcated from the wall tissue.

c. The wall tissues differentiate into three layers and the central tissues show a radial arrangement.

d. The pycnidium orientated by the development of a delicate mass of tissue immediately below the outer film of substratum, and the growth of hyphae from the pycnidium to form a basal "stroma." The central portion of the inner tissues becomes very finely divided, and projections or tongues of wall tissue grow into the delicate inner tissues.

e. Differentiation is more marked and the ostiole begins to form.

f. On the final rupture of the ostiole the pycnospores issue forth in a diffuse mass.

g. Rupture of the ostiole by the pushing over to one side of the outer wall layer.

h. Rupture of the ostiole by the tearing free of the outer wall layer.

The diameter varies from 80-150 μ, and the pycnidium may be pear-shaped, globular, or oblately spheroidal. The basidia are 12-14 μ long and more or less acicular, with a swollen base, or phial shaped. (*Pl.* II., *Fig.* 5.)

A few observations were made with a view to ascertaining what factors condition the orientation of the pycnidium, for the latter in early stages of its development is isodiametrical.

Two plate cultures were supported on their edges so that the immature pycnidia on the one plate received the light through the medium on their potential basal sides, whilst those on the other plate received it from above on their potential ostiolar sides. The face of each plate remote from the light was rendered opaque. The development of the pycnidia in both cases was perfectly normal, the ostiole being away from the nutrient substratum.

A portion of a plate culture containing developing pycnidia was cut out, placed on the bottom of a small sterile bottle, and this exhausted as far as possible of air. The pycnidia matured in a perfectly normal manner.

A plate culture with young pycnidia was flooded with its own nutrient medium (potato gelatine) to a depth of about six millimetres, so that the developing structures were in a middle plane. The pycnidia matured and were rather larger than usual, and hyphae from the wall grew out into the overlying food layer. The orientation of the pycnidia was completely disturbed, no definite ostiole was formed, and in many cases the wall was quite irregularly burst to allow of the exit of the spores. In other cases no opening of any kind was formed.

When a very thin film of nutrient material was poured over a plate containing developing pycnidia or the added layer was very frothy from violent shaking the disturbing effect, although still apparent, was not nearly so well marked.

These observations, though somewhat primitive and inconclusive, would appear to indicate that relation to food supply, and not light or aeration, is the primary factor conditioning the orientation of the pycnidium.

Infection Experiments.—Infection experiments were carried out on *Lavandula officinalis*, using pure cultures of the fungus grown on lavender gelatine. The results of this work are summarised below.

Experimental Infections on Lavandula officinalis.

Treatment.	Spore.	First Distinct Signs of Infection.	Result.
1. Suspension of spores in sterile water brushed on the surface of 12 shoots.	Pycnospore	On 11 shoots in 9-10 days. On 1 shoot in 15 days	Pycnidial formation in about 31 days.
	Hyaline Conidium.	On 10 shoots in 10-11 days. On 2 shoots in 17 days	Pycnidial formation in about 37 days.
	Brown Conidium.	None after 30 days ...	None.
	Chlamydospore.	None after 30 days ...	None.

Treatment.	Spore.	First Distinct Signs of Infection.	Result.
2. Spores digested in artificial gastric juice for 12 hours; then washed in sterile water and brushed on the surface of 12 shoots.	Pycnospore	On 1 shoot after 14 days.	Slight infection of 1 shoot. No pycnidial formation. Feeble mycelium in shoot determined as *Phoma lavandulae*.
	Hyaline Conidium.	None after 30 days ...	None.
	Brown Conidium.	On 5 shoots in 12 days On 1 shoot in 18 days	Pycnidial formation on 4 shoots after about 40 days. Mycelium in 2 remaining shoots identified as *Phoma lavandulae*.
	Chlamydospore.	On 7 shoots in 11-12 days.	Pycnidial formation on 6 shoots after about 40 days. Mycelium in remaining shoot identified as *Phoma lavandulae*.
3. Suspension of spores in sterile water frozen for about 14 minutes, and subsequently brushed on the surface of 12 shoots.	Pycnospore	None after 30 days ...	None.
	Hyaline Conidium.	None after 30 days ...	None.
	Brown Conidium.	On 7 shoots in 14 days	Pycnidial formation on 3 shoots after about 40 days. On 1 shoot after about 60 days. Mycelium in 3 remaining shoots identified as *Phoma lavandulae*.
	Chlamydospore.	On 8 shoots in 12-14 days. On 1 shoot in 17 days	Very sparing pycnidial formation on 5 shoots after about 40-43 days. Mycelium in 3 remaining shoots identified as *Phoma lavandulae*.

No definite controls were kept, but all the inoculated plants were either amongst others in a bed or had other plants in their immediate vicinity. The disease only appeared on those shoots experimentally infected. Where no pycnidial formation occurred the infected shoots were carefully sectioned and the mycelium present compared minutely with mycelium definitely known to be that of *Phoma lavandulae*.

Similar infection experiments were carried out on *Lavandula spica* with approximately equal results. Infection experiments were made with pycnospores only on *Lavandula vera* and *Lavandula lanata*, and pycnidial formation obtained in both cases.

Attempts were made to infect the following plants: *Chrysanthemum* sp., *Salvia* sp., *Vinca* sp., *Artemisia* sp., *Santolina* sp., *Aristolochia* sp., *Aster* sp., *Malva* sp., *Helianthus* sp., *Lindera* sp., *Crataegus* sp., *Calluna* sp., and *Syringa* sp.

The first trials were made with pycnospores directly transferred from lavender shoots, and these were placed both on the normal surface or in wounded tissues. No infections occurred.

Subsequently the fungus was transferred to a mush made by grinding the externally sterilised and washed fresh tissues of the individual plants with fine sterile sand in a mortar. No growth occurred on mush of *Artemisia*, *Santolina*, *Helianthus*,

and *Calluna*, and on each of the others but a slight growth was obtained. This appeared most promising on *Salvia*, *Vinca*, *Aster*, and *Malva*, and subcultures were made to freshly prepared mush of these plants. Portions of the most vigorously growing mycelium with a little mush were then placed on wounded and unwounded surfaces of the suitable plants. No infection occured, and subsequent examination showed that the mycelium in every case had died after growing for a little time in the mush.

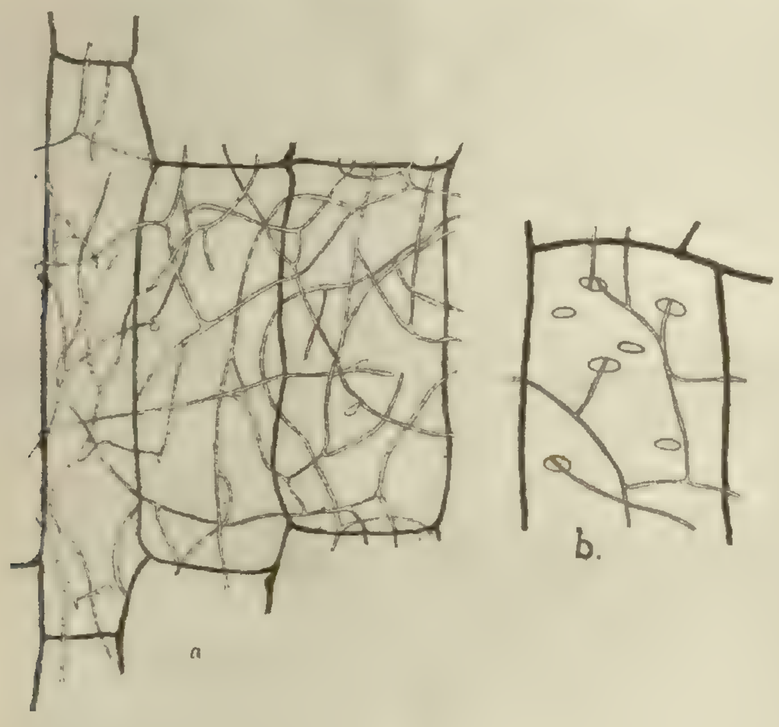
It would appear, therefore, that the fungus is pathogenic to the genus *Lavandula*, and probably confined to this genus.

8. Shoot of *Lavandula officinalis* infected at K_1 with pycnospores and at K with thick-walled brown conida treated with gastric juice. Shoot drawn eighteen days later. Pycnidia were subsequently formed on the stem portion but not on the leaves. ($\frac{2}{3}$ normal size.)

Relation of Fungus to Tissues of Host.—The fungus is primarily found in the stem tissues of its host. Rarely the leaf shows infection distinct from its supporting stem, and this

may occasionally be produced by artificial inoculation. (*Text Fig.* 8.) Pycnidia have never been found on the leaves.

At first the fungus mycelium spreads in the cortex of the host, radiating in fairly well defined "strands" or "tracks" from the point of infection. Much of this early mycelium may be regarded as distributive in that it consists of elongate little branched hyphae which penetrate the tissues principally in a direction parallel to the axis of the host. Later the mycelium is freely branched and forms a complex ramifying system in the host tissues. From the cortex the hyphae pass to the phloem groups and thence along the medullary rays to the pith, in which the fine mycelium is very abundant. (*Text Fig.* 9.)



9a. Hyphae of fungus ramifying in pith cells of host.
9b. Hyphae passing through pits in the walls of pith cells of host.
The hyphae are very slender and freely branched.
(Swift $\frac{1}{6}$ obj. × III. eyepiece, reduced by one half.)

From the medullary rays and phloem groups the hyphae penetrate the xylem elements, branching little, but either running longitudinally through them or crossing at right angles to their length.

The hyphae enter the cells through the pits which are abundantly present in the walls—(*Text Fig.* 9*b*)—and where a hypha passes through a deep pit as in the walls of sclerenchymatous or tracheidal elements a definite constriction is visible. (*Pl.* V., *Figs.* 6, 7, 8.)

At point of entry and exit to such a pit an appressorium like dilation is present in the hypha.

The cells of the cortex, phloem, and cambium are rapidly killed and collapse—(*Pl.* V., *Fig.* 9; *Pl.* VI. *Fig.* 4)—and there appears to be no response of any kind on the part of the host. The cell walls do not seem to be affected by the fungus, and no trace of enzyme action could be discerned.

The pycnidia of the fungus are formed immediately below the epidermis, or at a depth of a few cells, and usually cause the latter to split away from the collapsed cortex. (*Pl.* V., *Fig.* 9; *Pl.* VI., *Fig.* 4.)

No conidial formation occurs on the host plant, but in old dried diseased shoots occasional chlamydospores are found. (*Pl.* V., *Fig.* 6.) These are frequently in organic connection with the Phoma mycelium. By teasing the tissues apart individual spores may be picked up on a glass hair and thus isolated. In size and appearance they resemble the chlamydospores found in artificial culture media. Of six spores tested in lavender extract three germinated and these only in ten, thirty and thirty-three days respectively. Of six spores digested with gastric juice, washed and placed in lavender extract, two germinated, both in about twelve hours. Unfortunately no growth of mycelium could be obtained from these spores, but there can be little doubt that they are homologous with the chlamydospores found in pure cultures of the fungus.

The minuteness of the pycnospores precluded the obtaining of definite information as to the manner in which they penetrate the host plant. It is to be noted, however, that under natural conditions the pycnospores are usually found in considerable number in or about the stomata, and that artificial infections very often appear to centre in a stoma.

Relation of Spores to Temperature and Desiccation.—A number of observations were made on the relation between the germinative capacity of the spores of the fungus, and various degrees of temperature and desiccation. The results are summarised in a tabulated form on pages 126 9.

The hyaline thin-walled spores are very considerably less resistant than the brown thick-walled spore forms. Both the former, and the majority of the latter, are killed by exposure to a temperature of 53° C. for 17 hours. The hyaline conidia are on the whole more resistant than the pycnospores, but both forms are unable to withstand a temperature below zero. When, however, the pycnospores remain in the pycnidia they are considerably more resistant to low temperatures, and may even survive over winter in a germinable condition.

The thick-walled brown conidia and chlamydospores are immune to the action of frost, and exposure to such a temperature merely results in the curtailment or elimination of their resting period.

Prolonged desiccation rapidly destroys the germinative capacity of the pycnospores and hyaline conidia, but is almost without effect on the thick-walled spore forms.

Relation of spores to temperature and desiccation.

Room temperature approximately 14°—16° C.

Nutrient medium used for all experiments was aqueous extract of lavender shoots.

Treatment.	Spore.	Result.				Per cent. germination.
I. A suspension of spores in sterile water was smeared over six glass cover slips, and the films air dried. They were then placed in a paraffin oven at 53° C. for 17 hours. On removal a drop of nutrient medium was placed on the centre of each cover slip over the spores, and the cover slips inverted over Van Tieghem cells, and placed in a dark cupboard at room temperature.		Total number of spores.	Number of spores germinated.			
	Pycnospore ...	531	0			0
	Hyaline conidium.	327	0			0
	Brown conidium.	230	35	After 27 days.		15
	Chlamydospore	123	27			22
II. Transfers were made from a suspension of spores in water to hanging drops of nutrient medium on six glass cover slips, and these inverted over Van Tieghem cells. They were placed in a paraffin oven at 53° C. for 17 hours, and then removed to a dark cupboard at room temperature.		Total number of spores.	No. of spores germinated during first 17 hours in paraffin oven.	No. of spores germinated later.	Total number of spores germinated.	
	Pycnospore ...	467	0	0	0	0
	Hyaline conidium.	218	0	0	0	0
	Brown conidium.	242	0	19 After 27 days.	19	8
	Chlamydospore	153	0	23	23	15
III. Treatment as in I., but films placed for 17 hours in an incubator at 33-34° C.		Total number of spores.	Number of spores germinated.			
	Pycnospore ...	283	57	In 24 hours.		20
	Hyaline conidium.	320	74			23
	Brown conidium.	153	107	After 27 days.		70
	Chlamydospore	97	67			69
IV. Treatment as in II., but hanging drops placed for 17 hours in an incubator at 33-34° C.		Total number of spores.	No. of spores germinated during first 17 hours in incubator.	No. of spores germinated later.	Total number of spores germinated.	
	Pycnospore ...	193	0	104 During next 24 hrs.	104	54
	Hyaline conidium.	121	0	66	66	55
	Brown conidium.	350	0	213 After 27 days.	213	61
	Chlamydospore	54	0	34	34	63

Treatment.	Spore.	Result.				Per cent. germination.
		Total number of spores.	Number of spores germinated.			
V. Treatment as in I., but films placed for 17 hours in an incubator at 22-23° C.	Pycnospore ...	353	211	In 24 hours.		60
	Hyaline conidium.	201	127			63
	Brown conidium.	197	144	After 27 days.		73
	Chlamydospore	89	57			64

Treatment.	Spore.	Total number of spores.	No. of spores germinated during first 17 hours in incubator.	No. of spores germinated later.		Total number of spores germinated.	
VI. Treatment as in II., but hanging drops placed for 17 hours in an incubator at 22-23° C.	Pycnospore ...	453	340	18	In 24 hours.	358	79
	Hyaline conidium.	320	230	10		240	75
	Brown conidium.	397	2*	301	After 27 days.	303	84
	Chlamydospore	156	0	135		135	86

Treatment.	Spore.	Result.				Per cent. germination.
		Total number of spores.	Number of spores germinated.			
VII. Treatment as in I., but films placed for 17 hours in a dark cupboard at room temperature 14-16° C.	Pycnospore ...	327	206	During 24 hours.		63
	Hyaline conidium.	404	258			64
	Brown conidium.	233	184	After 27 days.		79
	Chlamydospore	135	101			75

Treatment.	Spore.	Total number of spores.	No. of spores germinated during first 17 hours in cupboard.	No. of spores germinated later.		Total number of spores germinated.	
VIII. Treatment as in II., but hanging drops left for 17 hours in a dark cupboard at room temperature 14-16 C.	Pycnospore ...	125	117	0	During next 24 hrs.	117	94
	Hyaline conidium.	300	255	3		258	86
	Brown conidium.	99	4*	84	After 27 days.	88	89
	Chlamydospore	84	0	71		71	84

* It is probable that these spores had not properly thickened their walls.

Treatment.	Spore.	Result.				Per cent. germination.
		Total number of spores.	No. of spores germinated after removal to room temperature.			
IX. Treatment as in I., but films placed in a capsule, which was then sealed, and left exposed to a temperature below freezing point for 17 hours.	Pycnospore ...	417	8	During 24 hours.		2
	Hyaline conidium.	372	11			3
	Brown conidium.	197	146	During 24 hours.		74
	Chlamydospore	230	162			80
		Total number of spores.	No. of spores germinated within 24 hours of removal from cold to room temperature.	No. of spores germinated during next 24 hours.	Total number of spores germinated.	
X. Treatment as in II., but hanging drops placed in a capsule, and left exposed to a temperature below freezing point for 17 hours.	Pycnospore ...	473	0	0	0	0
	Hyaline conidium.	231	1*	4*	5	2
	Brown conidium.	303	180	11	191	63
	Chlamydospore	187	135	5	140	75
		Total number of spores.	Spores germinated during first 24 hours after removal.	Spores germinated during next 24 hours.	Total number of spores germinated.	
XI. Treatment as in I., but films left in a dark cupboard at room temperature for 7 days.	Pycnospore ...	715	438	12	450	63
	Hyaline conidium	451	265	17	282	62
	Brown conidium	461	2	0	2	4
	Chlamydospore	250	0	0	0	0
XII. Treatment as in I., but films left in a dark cupboard at room temperature for 33 days.	Pycnospore ...	583	23	10	33	6
	Hyaline conidium	414	41	15	56	13
	Brown conidium	195	150	14	164	84
	Chlamydospore	123	95	7	102	83

* It is probable that those spores were thick-walled brown conidia.

Treatment.	Spore.	Result.				Per cent. germination.
		Total number of spores.	Spores germinated in first 24 hours.	No. of spores germinated during next 24 hours.	Total number of spores germinated.	
XIII. Spores subjected to the action of artificial gastric juice for 12 hours, then washed, and placed in a hanging drop of lavender extract in a Van Tieghem cell at room temperature.	Pycnospore ...	265	1	0	1	4·4
	Hyaline conidium	123	3	0	3	3
	Brown conidium	97	64	16	80	82
	Chlamydospore	69	51	3	54	78
XIV. Suspension of spores in sterile water frozen for about 14 minutes, and subsequently covered by a hanging drop of nutrient medium in a Van Tieghem cell, and kept at room temperature.	Pycnospores ...	521	2	0	2	4·4
XV. Pycnidia teased from shoot, and suspended in water. Then frozen to slide for about 14 minutes. Picked out with glass hair, and placed in sterile water. Crushed, and loopfuls transferred to nutrient medium in a Van Tieghem cell.	Pycnospores ...	267	97	6	103	38

The Action of certain Enzymes on the Spores.—The pycnospores and hyaline conidia are killed by treatment with pepsin for twelve hours (artificial gastric juice, 100 c.c. of 0·4 per cent. hydrochloric acid added to 0·2 grams of pepsin dissolved in 100 c.c. of water). The effect of similar treatment on the thick-walled brown spore forms is to eliminate their resting period and render them capable of germination in a few hours. This result is apparently identical with that produced when the spores are subjected to a temperature below zero. One important point, however, is to be noted. Under normal conditions the spores are able to withstand repeated freezings, but after treatment with pepsin for twelve hours they are killed if exposed to frost for seventeen hours. Prolonged immersion in gastric juice or repeated alternate periods of immersion and desiccation reduce the germinative capacity of the spores. Spores which have passed through their resting period and are therefore immediately germinable are still resistant to repeated freezings, but not to repeated treatment with pepsin.

Treatment with trypsin (5 c.c. of Benger's liquor pancreaticus + 5 c.c. of 0·5 per cent. sodium carbonate) gave results much more variable but in effect substantially similar to those of pepsin.

Dilute solutions of diastase of malt, and invertase fairly rapidly reduced the germinative capacity of the thin-walled conidia and pycnospores, and slowly that of the brown thick-walled spores. No effect on the duration of the resting period of the latter was observed.

Conclusion.—The life history of *Phoma lavandulae* on its host plant is simple. The overwintering of the fungus and spring infection of the host is by means of the occasional chlamydospores, and pycnospores remaining in pycnidia, present in decaying fragments of old diseased shoots. The rapid spread of the disease during the summer months is due to the pycnospores which are produced in immense numbers. By the removal of all affected shoots as soon as noted, and if possible before pycnidia are formed, the disease may be kept in check.

Summary.—A serious disease of the genus *Lavandula* is caused by *Phoma lavandulae*, Gabotto, a fungus which is here recorded for England.

In pure culture on nutrient media the fungus produces hyaline thin-walled pycnospores, hyaline thin-walled conidia—which later become thick-walled and brown—and thick-walled brown chlamydospores.

The thin-walled spores germinate almost immediately, are little resistant to desiccation and are killed by frost.

The thick-walled spores are fairly resistant to prolonged desiccation, and only germinate after a resting period which may be eliminated by freezing or the action of pepsin or trypsin.

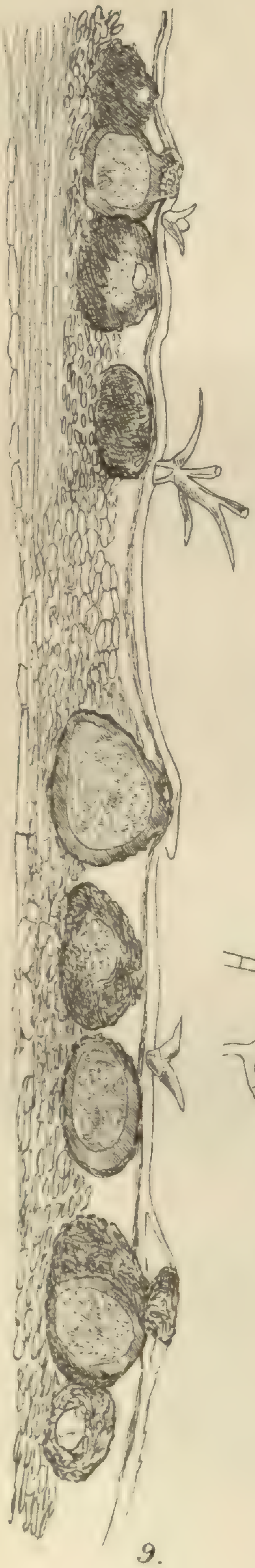
All spore forms germinate freely in vegetable nutrient media and the optimum temperature for the growth of the mycelium is about 18–20° C.

The development of the pycnidium is described and observations indicating that its orientation is conditioned by its relation to the food supply.

Infection experiments were carried out and demonstrated the pathogenicity of the fungus to the genus *Lavandula* and the fact that the fungus is probably confined to this genus.

The fungus mycelium ramifies throughout the host tissues and causes the cortex and phloem groups to collapse. The hyphae pass from cell to cell through the abundant pits in the walls.

The pycnidia are formed immediately below the epidermis which is lifted away from the cortex. Conidial formation is absent from the normal life cycle but chlamydospores are occasionally formed.



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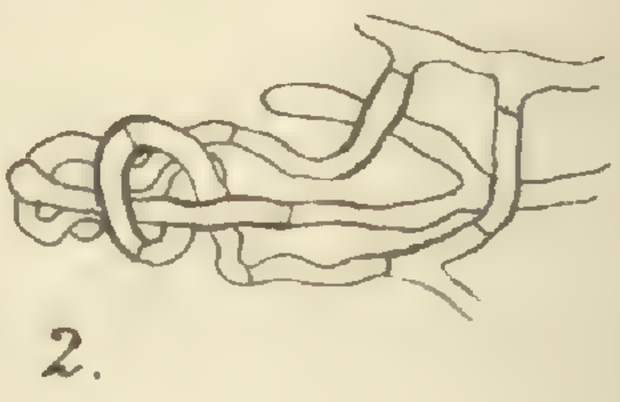

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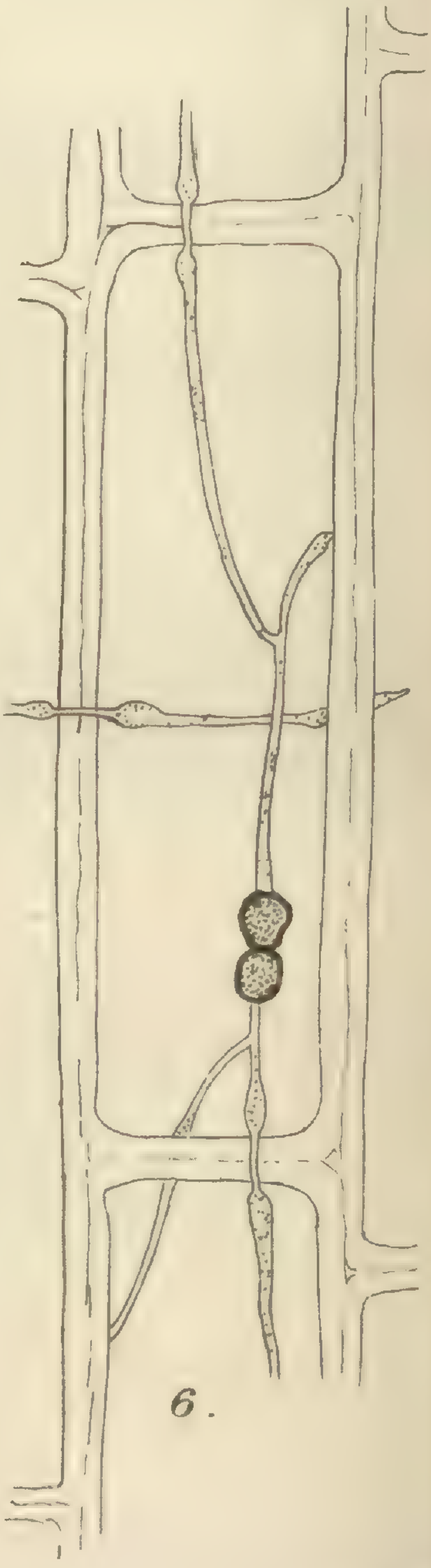

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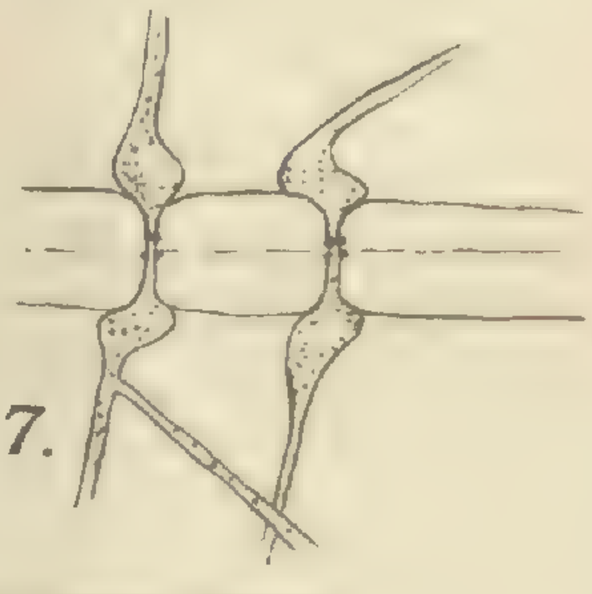

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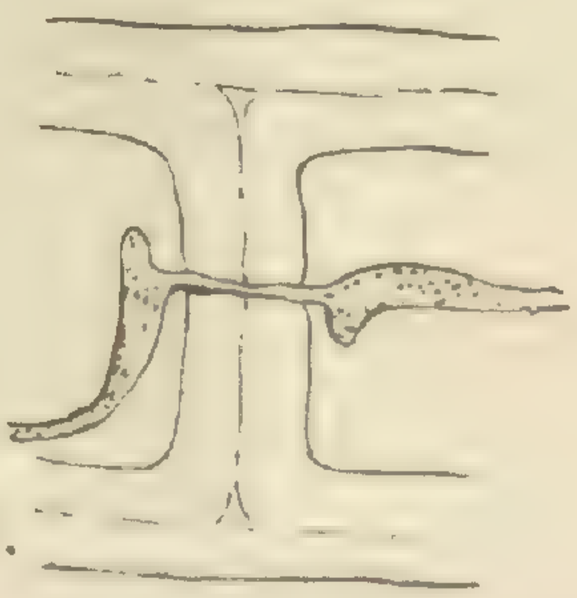

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Phoma lavandulae.

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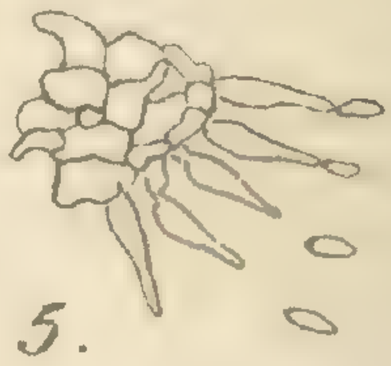

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Explanation of Plates.

Plate V.

Fig. 1.—Formation of transverse wall in hypha by the ingrowth of a ring-like diaphragm of cell wall substance. (Leitz $\frac{1}{12}$ oil immersion × 8 oc.)

Figs. 2, 3 *and* 4.—Young stages in the formation of pycnidia. (Swift $\frac{1}{8}$ obj. × III. eyepiece.)

Fig. 5.—Swelling in wall tissues at the position of the future ostiole. This drawing was made from a specimen immediately prior to dehiscence; the pycnospores are ready to emerge. (Swift $\frac{1}{6}$ obj. × III. eyepiece.)

Fig. 6.—Chlamydospores of fungus in host tissue. (Swift $\frac{1}{6}$ obj. × III. eyepiece.)

Figs. 6, 7 *and* 8.—Passage of hyphae through cell walls of host. In the pit the hypha is constricted but dilates at points of entry and exit. (Swift $\frac{1}{6}$ obj. × III. eyepiece.)

Fig. 9.—Longitudinal section of a lavender stem attacked by the fungus. The developing pycnidia have lifted the epidermis away from the collapsed cortical tissues. (Swift $\frac{2}{3}$ obj. × I. eyepiece.)

Plate VI.

Fig. 1.—Pycnospores germinating on lavender extract at room temperature. (Swift $\frac{1}{8}$ obj. × III. eyepiece.)

Fig. 2.—Formation of thin-walled conidia on prune gelatine at room temperature. Note the very characteristic necks formed at point of abstriction. (Swift $\frac{1}{6}$ obj. × III. eyepiece.)

Fig. 3.—Thick-walled brown conidia from same culture as 2 but eight days later. (Swift $\frac{1}{8}$ obj. × III. eyepiece.)

Fig. 4.—Vertical section of a mature dehisced pycnidium growing on its host. Note the collapsed cortex and lifted epidermis, the basal stroma of thick-walled hyphae and the ingrowths from the wall tissue into the receptacle. (Swift $\frac{1}{6}$ obj. × III. eyepiece.)

Fig. 5.—Basidia abstricting spores. (Swift $\frac{1}{8}$ obj. × III. eyepiece.)

XXIII.—DECADES KEWENSES

Plantarum Novarum in Herbario Hortii Regii Conservatarum.

DECAS LXXXVIII.

871. **Glyptopetalum Lawsonii,** *Gamble* [Celastraceae-Celastreae]; species *G. zeylanico*, Thwaites, affinis, foliis coriaceis apicem versus tantum grosse serratis, cymis 7-floris axillaribus vel supra-axillaribus differt.

Frutex erectus, glaber, ramulis crassis glabris supremis paullo complanatis. *Folia* opposita vel subalterna, elliptico-obovata vel elliptica, apice acuta, obtusa vel interdum emarginata, basi cuneata, 5–9 cm. longa, 3–6 cm. lata, coriacea, siccitate pallide viridia, integra vel apicem versus dentibus paucis (3–4) grosse serrata; costa crassa, nervis lateralibus utrinsecus 7–9 elevatis inter se reticulatione conspicua junctis; petioli crassi, 5 mm. longi. *Cymae* axillares vel supra-axillares, dichotomae, 6–7-florae; pedunculus 2–3 cm. longus, complanatus, ad apicem bracteolis 2 oblongis 4 mm. longis munitus; rami primarii 8–10 mm. longi, bracteolis parvis muniti, secundarii circiter 4–5 mm. longi, etiam bracteolis parvis ad mediam partem instructi. *Calyx* 4-lobus, lobis brevibus ad apices nigro-scariosis.

Petala 4, ovata, obtusa, 3 mm. longa, foveolis binis obliquis apicem versus munita. *Stamina* 4; filamenta brevia, crassa, antherarum thecis divergentibus. *Ovarium* cum disco conicum, loculis 4 uniovulatis, stylo brevi. *Capsula* (immatura) subglobosa, glabra, 1·4 cm. lata, seminibus conspicue arillatis.

South India. Nilgiri Hills, *Wight;* Sigúr Ghát, North Nilgiris, *M. A. Lawson;* Geddesala Ghát, Coimbatore, *A. W. Lushington.*

872. **Microtropis Stocksii,** *Gamble* [Celastraceae-Celastreae]; species *M. latifoliae,* Wight, affinis, foliis minus coriaceis ellipticis vel oblanceolatis apice acutis, nervis subtus conspicuis, capsula oblonga differt.

Arbor, ramulis nigro-violaceis teretibus interdum rugosis. *Folia* elliptica vel oblanceolata, apice acuta, basi cuneata, 7–15 cm. longa, 2·5–6·5 cm. lata, coriacea, marginibus reflexis, nervis utrinsecus 8–10 prope marginem arcuatim junctis, secundariis ut reticulatione subtus conspicuis supra obscuris; petioli crassi, 5–7 mm. longi. *Flores* parvi, in axillis foliorum vel foliorum delapsorum glomerati. *Sepala* 5, ovata, inaequalia, margine dentata. *Petala* 5, unguiculata, ungue cum disco connato. *Discus* annularis, circiter 1 mm. latus. *Stamina* 5, and marginem disci inserta, filamentis subulatis, antheris suborbicularibus. *Ovarium* conicum, striatum. *Capsula* ovato-vel obovato-oblonga, laevis, apice acuta, 1·5–2 cm. longa. *Cotyledones* plani, elliptici.

South India. Coorg, *Hohenacker* 454; Concan, *Stocks;* Anamalai hills of Coimbatore District at Aiyarpadi, Paralai, etc., *C. A. Barber* 3839, 3899, 3971, 5418 (coll. 1901–1903); without definite locality, *Wight* 447 (partly).

Owing partly to there being several sheets of Wight's 447 clearly not collected from the same plant, this species has been confused with *M. latifolia,* of which I take the type to be the specimen collected at Sispara, Nilgiris, and named by Wight. In Dr. Cooke's Flora of Bombay it is described as *M. latifolia.* Dr. Barber's fine series of specimens clearly show it to be distinct from *M. latifolia,* especially in the size, shape and texture of the leaves.

873. **Hippocratea Bourdillonii,** *Gamble* [Hippocrateaceae]; species *H. obtusifoliae,* Roxb., affinis, foliis oblongis magis coriaceis basi rotundatis marginibus recurvis, petalis dorso mucronatis et disco apice puberulo differt.

Frutex scandens, ramulis subcrassis ultimis quadrangularibus. *Folia* oblonga, apice subito acuta, basi rotundata, 6–10 cm. longa, 3–4 cm. lata, coriacea, glabra, lucida, marginibus recurvis, aliquando apicem versus parce crenulata; costa conspicua; nervi laterales utrinsecus circiter 12, marginem versus arcuatim juncti, reticulatione ramosa conspicua. *Cymae* dichotomae, axillares, ad 3 cm. longae, pedunculo 2 cm. longo, bracteolis ad nodos ramorum ovato-acutis parvis. *Calyx* perbrevis, puberulus, lobis ovatis. *Petala* e basi lato lanceolata, acuminata, 5 mm. longa,

dorso ad apicem mucronata, intus pubescentia. *Discus* conspicuus, subcylindricus, apice puberulus, basi annulatus. *Stamina* 3, puberula, primum erecta, deinde recurva, antherarum thecis 2 medio transverse fissis. *Ovarium* disco immersum, stylo subulato. *Fructus* ignotus.

South India. Travancore; near Colatoorpolay, 100 m. alt., in evergreen forest, Feb. 1894, *T. F. Bourdillon* 158.

874. **Salacia malabarica,** *Gamble* [Hippocrateaceae]; affinis *S. reticulatae,* Wight, foliis majoribus oblongis chartaceis, pedicellis longioribus gracilibus, petalis albo-marginatis differt.

Frutex scandens, ramulis nigro-purpureis conspicue lenticellatis. *Folia* opposita, oblonga, apice obtusa, basi paullo attenuata, 8–16 cm. longa, 4–7 cm. lata, chartacea, glabra, margine obscure et remote serrata, nervis lateralibus utrinsecus 7–10 marginem versus curvatis, reticulatione obscura; petioli crassi, circiter 1 cm. longi. *Flores* parvi, e tuberculis axillaribus vel lateralibus fasciculati, 2–12-nati, 5 mm. lati; pedicelli graciles, 1·2–1·5 cm. longi. *Calyx* minutus, lobis 5 parvis ovatis. *Petala* oblonga, glabra, albo-marginata. *Discus* crassus, ovarium cingens. *Stamina* 3, intra marginem disci affixa, recurvata, filamentis brevibus, antherarum thecis transverse fissis. *Stylus* conicus, minutus. *Fructus* ignotus.

India. Madras Presidency; plains of S. Canara, *Beddome;* moist forest at the foot of the Travancore hills, *T. F. Bourdillon.*

875. **Salacia Beddomei,** *Gamble* [Hippocrateaceae]; species *S. macrospermae,* Wight, affinis, foliis majoribus, nervis lateralibus magis regularibus, calycis lobis fimbriis ferrugineis magis conspicue munitis differt.

Frutex, ramulis crassis brunneis minute lenticellatis. *Folia* opposita, elliptico-oblonga, apice breviter et abrupte acuta, basi subrotundata, 12–14 cm. longa, 5–7 cm. lata, coriacea, glabra, margine paullo undulata, nervis lateralibus circiter 12 primum rectis pone horizontalibus marginem versus arcuatim junctis, reticulatione conspicua; petioli crassi, rugosi 7–8 mm. longi. *Flores* parvi, e tuberculis axillaribus 4–12-floris fasciculati, circiter 3 mm. lati; pedicelli graciles, vix 5 mm. longi. *Calyx* minutus, lobis concavis ovatis fimbriis ferrugineis conspicue munitis. *Petala* obovata, glabra, 1·5 mm. longa. *Discus* magnus, fere cylindricus, ovarium cingens. *Stamina* 3, intra marginem disci inserta, reflexa, filamentis brevibus crassis, antherarum thecis globosis transverse dehiscentibus. *Stylus* conicus, exsertus. *Fructus* ignotus.

India. Madras Presidency; Anamalai hills of Coimbatore, *Beddome.*

876. **Salacia Talbotii,** *Gamble* [Hippocrateaceae]; species *S. macrospermae,* Wight, affinis, foliis angustioribus oblanceolatis, pedicellis gracilibus, fructu juventute saltem conspicue tuberculato differt.

Frutex scandens, ramulis teretibus brunneis minute lenticellatis divaricatis. *Folia* opposita, oblanceolata, apice abrupte acuta, basi in petiolum longe attenuata, 6-12 cm. longa, 3-4 cm. lata, coriacea, utrinque glabra, marginibus obscure undulatis recurvis; nervi laterales circiter 8, irregulares, ramosi, reticulatione infra conspicua; petioli graciles, 5–7 mm. longi. *Flores* parvi, in fasciculis multifloris e tuberculis axillaribus glomerati, vix 3 mm. lati; pedicelli graciles, 5 mm. longi. *Calyx* minimus, lobis 5 obtusis, margine dentato fimbriis ferrugineis munito. *Petala* oblonga, obtusa crassa, marginibus albescentibus. *Discus* pulvinatus, ovarium arcte cingens. *Stamina* 3, recurvata, filamentis brevibus latis, antherarum thecis transverse dehiscentibus. *Stylus* brevis, exsertus, conicus. *Fructus* globusus, aurantiacus, ad 4 cm. diametro, juventute eximie tuberculatus, deinde rugosus. *Semina* 2 vel pluria, complanata, oblonga, cotyledonibus conferruminatis.

India. Bombay Presidency; Ainshi Ghát in N. Canara, up to 560 m. alt., *W. A. Talbot* 1217, 1361.

877. **Ventilago Goughii,** *Gamble* [Rhamnaceae–Ventilagineae]; species *V. calyculatae*, Tul., affinis, foliis oblongo-lanceolatis obtusis parvis et calycis tubo fructifero cupuliformi ad tertiam nucis partem solum adnato differt.

Frutex scandens, ramulis gracilibus griseo-puberulis. *Folia* oblongo-lanceolata, apice obtusa vel abrupte acuta, basi attenuata, 6–7 cm. longa, 2–3 cm. lata, chartacea, apicem versus obscure serrata, supra glabra, subtus praeter costam griseo-puberulam glabra; nervi laterales utrinsecus 12–15, marginem versus curvati et nervulis transversis numerosis inconspicuis parallelis juncti. *Flores* parvi, in glomerulis parvis secus ramulos panicularum axillarium vel lateralium circiter 7 cm. longarum. *Paniculae* griseo-puberulae, ramulis brevibus; bracteae et bracteolae lineares, caducae; flores circiter 3 mm. diametro. *Calyx* extra puberulus, intus glaber. *Petala* minuta, lata, cucullata. *Stamina* filamentis brevibus, antheris oblongis connectivo apiculato. *Discus* glaber. *Ovarium* villosum; styli 2, breves. *Samara* circiter 5 cm. longa, oblonga, reticulata, 1 cm. lata, parce puberula, nuce ad basin tubo calycis ad tertiam partem circumdato.

South India. Coorg, *Viscount Gough* 1838; Coonoor Ghát, Nilgiris, *M. A. Lawson*.

878. **Ventilago lanceolata,** *Gamble* [Rhamnaceae–Ventilagineae]; *V. maderaspatanae*, Gaertn., affinis, foliis oblongo-lanceolatis acuminatis, floribus minutis, ovario glabro et calycis tubo fructifero patelliformi basi nucis solum adnato differt.

Frutex scandens, ramulis teretibus glabris vel juventute puberulis tandem nigrescentibus. *Folia* oblongo-lanceolata, apice acuminata, mucronata, basi inaequaliter subrotundata, 6–10 cm. longa, 2–4 cm. lata, chartacea, praecipue apicem versus crenata, juniora subtus puberula, tandem glabra; nervi laterales utrinsecus 6–8, marginem versus curvati et nervulis transversis permultis parallelis horizontalibus juncti. *Flores*

minuti, in glomerulis parvis secus ramulos sinuatos panicularum axillarium vel lateralium fere sessiles. *Paniculae* graciles, ferrugineo-villosae, 2–7 cm. longae, ramulis paucis vix 1 cm. longis; bracteae caducae; bracteolae sub glomerulis plures lineares; flores vix 2·5 mm. diametro. *Calyx* extra villosus, intus glaber. *Petala* minuta, lata, cucullata. *Stamina* fere sessilia, connectivo nigro apice recurvo. *Discus* glaber, complanatus. *Ovarium* glabrum; styli 2, brevissimi. *Samara* circiter 5 cm. longa, oblanceolata, parce puberula, reticulata, vix 1 cm. lata, juventute ferrugineo-tomentosa, nuce ad basin in calycis tubo persistente patelliforme insidenti.

South India. Kanota, Malabar District, Dec., 1913, *C. A. Barber;* Tinnevelly Ghâts, etc., 1873, *Beddome.*

Ceylon: Hantame; at 600 m., *Gardner* 180; *Walker* 169.

879. **Turpinia malabarica,** *Gamble* [Staphyleaceae]; species *T. nepalensi,* Wall., affinis, floribus et fructibus majoribus, foliolis ellipticis tenuioribus abrupte et longe cuspidato-acuminatis differt.

Arbor, ramulis crassis, cortice brunneo. *Folia* opposita, imparipinnata, ad 30 cm. longa, 2–3-juga, subcoriacea, glabra; foliola elliptica, serrata, apice abrupte cuspidato–acuminata, 10–12 cm. longa, 4–5 cm. lata, acumine obtuso, terminalis et laterales subaequales; nervi laterales utrinsecus 5–6, curvati et prope marginem gradatim arcuatim juncti, nervulis transversis horizontalibus reticulatione infra conspicua; petiolus communis 6–10 cm. longus; petiolulus terminalis 3–5 cm. longus, laterales 0·5–1·5 cm. longi; stipulae foliaceae, deciduae. *Inflorescentia* axillaris, ad 18 cm. longa, ramis et ramulis oppositis in cymas desinentibus; bracteae et bracteolae caducae. *Sepala* 5, ovata, ciliata, 2 mm. longa. *Petala* 5, obovata, 3 mm. longa, ciliata, puberula. *Discus* brevis, crenatus. *Stamina* 5, filamentis parce villosis, antheris globosis. *Ovarium* 3–lobatum, glabrum, stylis connatis, stigmatibus capitatis. *Drupa* subglobosa, crassa, 1–3-locularis, 3–apiculata. *Semina* complanata.

South India. Concan, *Law & Stocks;* Anamalai hills in Coimbatore, *C. A. Barber* 3906, 4068, 5720; Travancore hills, 640 m. alt., *Beddome* 241; *T. F. Bourdillon.*

880. **Buchanania Barberi,** *Gamble* [Anacardiaceae-Mangifereae]; *B. Lanzan,* Spr., et *B. lanceolatae,* Wight, affinis, ab hac foliis apice obtusis subtus juventute villosis et nervis lateralibus rectis parallelis, ab illa foliis multo angustioribus differt.

Arbor, ramulis siccitate griseo-brunneis scabris. *Folia* oblongo-elliptica, apice obtusa vel brevissime acuta, basi attenuata, 8–13 cm. longa, 3–5 cm. lata, coriacea, supra lucida, subtus juventute ferrugineo-villosa, deinde glabra; costa crassa, supra impressa et carinata, infra conspicua; nervi laterales utrinsecus 16–20, recti, paralleli, a costa sub angulo circiter 75° abeuntes, prope marginem tantum curvati, supra paullo impressi, subtus prominentes; petioli 1 cm. longi. *Paniculae* ferrugineo–villosae, patentes, ramosae, ad 10 cm. longae, bracteis et bracteolis ovato-acutis munitae,

pedicellis 2–3 mm. longis. *Calyx* minimus, dentibus acutis villosis. *Petala* oblonga, acuta, glabra, 2·5 mm. longa. *Stamina* 10, filamentis gracilibus 1 mm. longis curvatis, antheris angustis. *Discus* crassus, crenulatus. *Carpella* basi villosa; fertile ovoideum. *Fructus* maturus adhuc ignotus.

South India. Travancore, Nadarai, Nov., 1904, *C. A. Barber* 6737.

XXIV.—DIAGNOSES AFRICANAE: LXVII.

1581. **Gnidia Flanagani,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 53, anglice [Thymelaeaceae-Euthymelaeeae]; species G. *coriaceae*, Meisn., affinis, ramis erectis parallelisque (nec divergentibus) distinguitur.

Suffrutex erectus, usque ad 3 dm. altus; rami erecti, stricti, glabri. *Folia* opposita, ovato-lanceolata, 1·2 cm. longa, 5 mm. lata, acuta, glabra, trinervia. *Flores* caulis apice congesti. *Calyx* glaber; tubus 1 cm. longus, parte inferiore paullo inflatus, supra expansus; lobi ovati, acuti, 3 mm. longi, 2 mm. lati. *Petala* 4, membranacea, 2 mm. longa, 1·5 mm. lata. *Antherae* vix 1 mm. longae, superiores exsertae filamentis brevibus crassis instructae. *Ovarium* oblongum, compressum; stylus calycis tubo aequilongus, rigidus; stigma penicillatum.

South Africa. Komgha Div.; grassy hills near Keimouth, *Flanagan* 621. Transkei; grassy slopes, Kentani, 15 m., *Miss Pegler* 32. Pondoland; grassy places between Umkwani and Omsakabo, *Tyson* 2636.

The erect parallel branches give this a facies very different from that of *G. coriacea*, Meisn., in which they are divergent.

1582. **Gnidia Galpini,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 55, anglice [Thymelaeaceae-Euthymelaeeae]; species *G. decurrenti*, Meisn., proximus, calycis lobis ovatis differt.

Suffrutex diffuse ramosus; rami glabri, rubescentes. *Folia* opposita, oblongo-lanceolata, acuminata, 1·2 cm. longa, 3 mm. lata, glabra, infra punticulata, marginibus involutis parte superiora. *Flores* ramorum apicibus germinati. *Calyx* glaber; tubus 7 mm. longus, infra cylindricus, supra late infundibuliformis; lobi ovati, obtusi, 3 mm. longi, 2 mm. lati. *Petala* 4, membranacea, elliptica, obtusa, 2 mm. longa, 1·5 mm. lata, hyalina. *Antherae* breviter oblongae, obtusae, 1 mm. longae, superiores exsertae filamentis brevibus rigidibus instructae. *Ovarium* oblongum, compressum, coma terminali instructum; stylus calycis tubo aequilongus, rigidus; stigma penicillatum.

South Africa. Riversdale Div.; Garcias Pass, 360 m., *Galpin* 4519.

This resembles *G. styphelioides*, Meisn., but differs in having a glabrous calyx. The stems are wiry.

1583. **Gnidia Cayleyi,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect 2, p. 57, anglice [Thymelaeaceae-Euthymelaeeae]; species G. *linoidi*, Wikstr., proximus, foliis elliptico-oblongis differt.

Planta 5–20 dm. alta, lignosa; rami recti, tenues, pubescentes. *Folia* opposita, elliptico-oblonga, acuta, 7 mm. longa, 1·5 mm. lata, glabra. *Flores* solitares, terminales. *Calyx* extra appresse sericeus; tubus 5 mm. longus, parte inferiore ovoideus, parte superiore infundibuliformis; lobi elliptici, 3 mm. longi, 1·5 mm. lati, acuti. *Petala* 8, minuta, antheris multo minora. *Antherae* oblonga, obtusae, vix 1 mm. longae. *Ovarium* compressum, glabrum; stylus excentricus, filiformis, calycis tubo fere aequilongus; stigma penicillatum.

South Africa. Without precise locality, *Herb. Caley in Herb. Kew.*

This much resembles *G. parvula*, Wolley-Dod, but differs in the small petals. A note on the sheet states that it agrees with a specimen in the Berlin Herbarium, collected on Table Mountain by Bergius.

1584. **Gnidia ericoides,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 58, anglice [Thymelaeaceae-Euthymelaeeae]; species ex affinitate *G. obtusissimae*, Meisn., a qua foliis lineari-oblongis homomorphis distinguitur.

Suffrutex nanus, ericoideus; rami erecti, robusti, primum pubescentes. *Folia* opposita, approximata, lineari-oblonga, 6 mm. longa, vix 1 mm. lata, obtusa, primum leviter pubescentia, mox glaberrima. *Flores* ad ramorum apices aggregati. *Calyx* extra appresse sericeus; tubus 1·2 cm. longus, infra ovoideus, supra infundibuliformis, costatus; lobi ovati, acuti, 4 mm. longi, 2·5 mm. lati. *Petala* 8, antheras simulantia, oblonga, obtusa, glabra, 2 mm. longa. *Antherae* 1 mm. longae, obtusae. *Ovarium* ovoideum, apice pilosum; stylus filiformis, 6 mm. longus; stigma penicillatum.

South Africa. Riversdale Div.; Tygerfontein, 184 m.. *Galpin* 4523.

1585. **Gnidia Woodii,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 60, anglice [Thymelaeaceae-Euthymelaeeae]; species *G. setosae*, Wikstr., affinis, foliis latioribus calyceque multo longiore differt.

Suffrutex erectus; rami virgati, primum pilis longis paucis instructi, mox glabri, cicatricibus parvis notati. *Folia* alterna, lanceolata vel oblongo-lanceolata, 2 cm. longa, 2–2·5 mm. lata, acuminata, glaberrima, uninervia. *Flores* pauci, ad ramorum apices posita. *Calyx* extra hirsuta, lutea (*Wylie*); tubus 1·6 mm. longus, infra paullo inflatus, supra cylindricus. *Lobi* ovati, 4 mm. longi, 1·5 mm. lati, acuti. *Petala* 8, lanceolata, crassa, 2 mm. longa, vix 0·5 mm. lata. *Antherae* oblongae, obtusae, 1 mm. longae. *Ovarium* oblongum, apice pilosum; stylus 1 mm. longus; stigma capitatum.

South Africa. Griqualand East; near Fort Donald, 1530 m., *Tyson* 1639. Natal; on grassy slopes, Inanda, *Wood* 153, 755;

near Pinewood, *Wood*. Zululand; Ingotye, *Wood*, and without precise locality, 1224–1530 m., *Wylie in Herb. Wood* 9014.

1586 **Gnidia Baurii,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 61, anglice [Thymelaeaceae-Euthymelaeeae]; species distinctissima, *G. Woodii*, C. H. Wright, affinis, foliis subtus sericeis habituque flaccidiore differt.

Suffrutex diffusus; rami graciles, debiles, primum pilosi, foliorum cicatricibus parvis prominentibus instructi. *Folia* opposita, lanceolata, acuminata, 1·2 cm. longa, 3 mm. lata, supra glabra, subtus appresse sericea. *Flores* geminati, terminales. *Calyx* extra sericeus; tubus 8 mm. longus, subtus ovoideus, supra anguste infundibuliformis; lobi ovati, 2 mm. longi. 1·5 mm. lati, acuti. *Petala* 8, oblonga, obtusa, 1 mm. longa, crassa. *Antherae* breviter oblongae, parvae, superiores exsertae, filamentis tenuibus instructae. *Ovarium* oblongum, apice pilosum; stylus gracilis, calycis tubo brevior; stigma parvum.

South Africa. Tembuland; Bazeia Mountain, 1070 m., *Baur* 732.

1587. **Gnidia Leipoldtii,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 64, anglice [Thymelaeaceae-Euthymelaeeae]; species ex affinitate *G. sericeae*, Linn., floribus quam folia multo longioribus differt.

Frutex multiramosus; rami diffusi, graciles, primum pubescentes, demum glabri et cicatricibus prominentibus instructi. *Folia* opposita, ovato-oblonga, acuta, 1·4 cm. longa, 6 mm. lata, utrinque dense appresse sericea, 1–3-nervia. *Flores* 2–6 ad ramorum apicem posita. *Calyx* dense tomentosus; tubus 1·4 cm. longus, leviter costatus, infra inflatus, supra subcylindricus; lobi ovales, 3 mm. longi, 2 mm. lati. *Petala* 8, vix 1 mm. longa, antheras simulantia, emarginata. *Antherae* petalis aequilongae, sed angustiores, obtusae. *Ovarium* ovoideum, apice pilosum; stylus filiformis, 8 mm. longus; stigma penicillatum.

South Africa. Calvinia Div.; Nieuwoudtville, Willems River and Bokkeveld Mountains, 612–918 m., *Leipoldt* 882. Somerset East Div.; on mountain sides near Somerset East, 1224 m., *Bolus* 1764.

1588. **Gnidia nitida,** *Bolus ex C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 64, anglice [Thymelaeaceae-Euthymelaeeae]; species *G. Leipoldtii*, C. H. Wright, affinis, foliis multo minoribus calyceque apprese sericeo differt.

Frutex diffuse ramosus; rami graciles, rigidi, primum hirsuti, mox glabrescentes, obscure tetragoni, foliorum cicatricibus parvis prominentibus instructi. *Folia* ad ramorum apices congesta, ovalia, rotundata vel subacuta, 6 mm. longa, 2 mm. lata, primum appresse sericea, demum glabra, obscure trinervia, marginibus parte superiore inflexis. *Flores* ad ramorum apices geminati. *Calyx* extra dense sericeus, luteus (*Bolus*); tubus 1·4 mm. longus, infra inflatus, supra anguste infundibuliformis; lobi 4 mm. longi, 2·5 mm. lati, subacuti. *Petala* 8, antheras simulantia.

2·5 mm. longa, obtusa. *Antherae* lineares, 1·5 mm. longae, obtusae. *Ovarium* compressum, glabrum; stylus filiformis, 8 mm. longus; stigma penicillatum.

South Africa. Little Namaqualand; in stony places near Ookiep, 900 m., *Bolus in Bolus & MacOwan, Herb. Norm. Austr.-Afr.* 689.

1589. **Lasiosiphon canoargentea,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 70, anglice [Thymelaeaceae-Euthymelaeeae]; species *L. splendenti*, Endl., affinis, foliis oblongo-lanceolatis brevioribus petalisque dentiformibus differt.

Frutex multiramosus; rami primum dense appresse albosericei, foliorum cicatricibus parvis prominentibus instructi. *Folia* alterna, oblongo-lanceolata, 1 cm. longa, 2·5 mm. lata, acuta, pilis appressis argenteis praecipue ad paginam inferiorem dense vestita; folia involucralia quam caulina duplo latiora. *Flores* plures. terminales. *Calyx* extra pubescens, pilis inferioribus quam superiores longioribus; tubus 1·2 cm. longus; lobi oblongi, obtusi, 3 mm. longi, 2 mm. lati. *Petala* minuta, dentiformia. *Antherae* quam petala triplo longiorae, oblongae, obtusae, 1 mm. longae. *Ovarium* oblongum, apice pilosum; stylus gracilis, rigidus, calyce aequilongus; stigma capitatum.

South Africa. Transvaal; Witte Kranz, near Lydenburg, *Wilms* 1298; on the sides of mountains near Lydenburg. *McLea in Herb. Bolus* 3020.

1590. **Lasiosiphon Wilmsii,** *C. H. Wright* in Dyer Fl. Cap. vol. v. sect. 2, p. 71, anglice [Thymelaeaceae-Euthymelaeeae]; species *L. Burchellii*, var. *glabrifolio*, Meisn., affinis, foliis obtusis differt.

Frutex ramosissimus; rami primum pilosi, rubescentes, foliorum cicatricibus parvis instructi. *Folia* alterna, brevissime petiolata, oblonga, acuta, 1·4 cm. longa, 3·5 mm. lata, glabra, coriacea, costa subtus prominente; folia involucralia caulinis majora, pilosa. *Flores* plures, terminales, ad vesperum suaveolentes (*Cooper*). *Calyx* extra dense sericeus; tubus 1·2 1·4 cm. longus, cylindricus; lobi aurantiaci (*Cooper*), oblonga, obtusa, 4 mm. longa, circiter 2 mm. lata. *Petala* minuta. *Antherae* 1·5 mm. longae, petalis triplo longiores, obtusae. *Ovarium* oblongum, glabrum; stylus calycis tubo aequilongus; stigma capitatum.

South Africa. Orange River Colony; Witteberg, *Rehmann* 3943. Basutoland; without precise locality, *Cooper* 696. Transvaal; by the Vaal River near Kloete, *Wilms* 1299. By the Crocodile River in Lydenburg District, *Wilms* 1299b.

This species resembles *L. anthylloides*, Meisn., but differs in having quite glabrous leaves (except the involucral) and a shorter calyx-tube.

XXV.—THE ARBORETUM AT TREGREHAN, CORNWALL.

W. J. Bean.

There are between a dozen and twenty gardens whose fame has spread over the whole country, and whose names we have come to regard as synonymous with Cornish gardening. But amongst them few would include Tregrehan, the seat of the Carlyon family. It is, indeed, a curious circumstance that so little should have been heard of this garden, which in the number, size and vigour of certain classes of trees and shrubs occupies a foremost place, not only in Cornish gardens but in those of the entire British Islands. Most of the species were planted, I believe, by the late Mr. George Carlyon, thirty to forty years ago. In the following notes a few of the more striking trees and shrubs are mentioned, but they do not profess to include all worthy of note.

Tregrehan has its full complement of rhododendrons, but they are so common to Cornish gardens, especially those of Himalayan origin, and have so often been mentioned in these pages that a detailed account of them is unnecessary. *R. Ungernii*, a Caucasian species, is allied to, and came into cultivation at the same time (1886) as, *R. Smirnowi*, but has remained a very scarce plant. At Tregrehan there is a fine bush 10 ft. high and 10 ft. through, in perfect health. A still rarer rhododendron, *R. Hookeri*, perhaps the scarcest in cultivation now of Himalayan species, is also about 10 ft. high. *R. cinnamomeum*, one of the *arboreum* group, is frequent enough in Cornwall, but I do not know of any tree so fine and shapely as that at Tregrehan, or one so tall. It has the broadly columnar or slightly tapering form characteristic of the sort and is between 25 ft. and 28 ft. in height. In several places in Cornwall a rhododendron is grown very like *R. Falconeri* in general aspect, but still in several characters and in time of flowering showing the influence of *R. argenteum*. It was not in flower at the end of March, but is considered to be a hybrid between these two species. There is a noble bush at Tregrehan 18 ft. high, with leaves up to 18 in. long.

Tregrehan stands out, I think, above all the Cornish gardens for the richness and health of its conifers. Of the better known types like those one sees in the Perthshire properties, there are many fine examples, such for instance as *Picea hondoensis* with a trunk girthing 5 ft. 10 in.; *P. Omorica* about 40 ft. high (about as fine probably as will be found in the country); *P. polita*, most remarkable perhaps of all Japanese species, 4 ft. 3 in. in girth of trunk; *Abies bracteata*, so rarely seen in fine condition, has a trunk 6 ft. 8 in. in girth. *Abies Webbiana* and its ally *A. Pindrow* are good and healthy (the former 40 ft., the latter 28 ft. high), but finer trees can be found elsewhere. Nowhere, however, in our islands, so far as I know, is there such a fine tree of *Abies Mariesii*. First discovered and introduced from Japan in 1879 by Chas. Maries, this fir has always been extremely rare and at one time appeared to have almost completely fallen out of cultivation. During a tour through the famous conifer collections of Scotland about ten years ago I found but a single small plant, which was in the gardens of Scone Palace. Since then a few more trees have

been introduced from abroad. The species is evidently a slow-growing one and the tree at Tregrehan may belong to Maries' original importation; it is 30 ft. high, its trunk 1 ft. 6½ in. in circumference, and far exceeds in size any tree of which there is common knowledge in this country.

Of other Japanese firs, *Abies Veitchii* about 3 ft. in girth; *A. firma*, 4 ft. 6 in. in girth; and *A. brachyphylla*, 5 ft. 8 in. in girth, are all handsome and notable trees. *A. pectinata pendula*, a weeping form of common silver fir, makes a curious object; the branches are so pendulous and keep so close to the trunk that the whole tree, although 40 ft. high, is only a few feet in diameter. There is also a very fine example of *Abies cephalonica* var. *Apollinis*, a form of the Greek fir with leaves blunter than in the type and more crowded on the upper side of the twig.

Of pines, the most remarkable in the garden is *Pinus patula*, a very distinct species from Mexico with leaves three in each sheath, of a characteristic pale glaucous hue and very slender and pendulous. The foliage is so plentiful that the whole framework of the tree is hidden by this grey mantle. The tree at Tregrehan has a trunk 7 ft. 7 in. in circumference and its head of branches and leaves is a dome-like mass apparently over 50 ft. high. Another smaller tree is interesting, because it is grafted at 2 ft. from the ground on Scotch pine. No two pines differ more from each other than these, in spite of which the tree is very healthy, the trunk already somewhat about 1 foot in thickness. There is a good tree of *Pinus Montezumae* (its trunk 5 ft. 3 in. in girth), also from Mexico, but as different as possible from *P. patula* in its long, stiff leaves and gaunt open habit. The Macedonian pine (*P. Peuke*) is represented by a tree rather better than those in the collection at Kew which (now 45–50 ft. high) have generally been regarded as about the best in the country. There is also a good tree of the Arolla pine (*Pinus Cembra*) with the characteristic bushy habit of this species and about 45 ft. high.

I have heard an eminent botanist and great traveller say that he had never seen a really fine *Cryptomeria japonica* out of Japan. There is a tree at Tregrehan which does not, of course, rival the trees in the famous avenue at Nikko in Japan, but it is in perfect health, its trunk is 9 ft. 3 in. in girth and its branches make a flawless pyramid of luxuriant greenery. *Cunninghamia sinensis* is a much more unsatisfactory tree in this country, yet there is one here with a trunk 6 ft. 2 in. in circumference. *Thuya dolabrata*, in perfect condition, is 30 ft. high.

With the exception of the two Mexican pines noted above, all the conifers hitherto mentioned are hardy enough to thrive in many other parts of the kingdom, and they cannot be regarded as typical of Cornish gardens, although rarely are they to be found in such splendid condition as at Tregrehan. But there is besides a very interesting assemblage of conifers from the Southern Hemisphere, more especially Chile and Australasia—regions of the globe which, next to the Himalaya, furnish the most characteristic vegetation of these south-western gardens. *Dacrydium cupressinum*, a graceful and distinct species from New Zealand but very rare in gardens, is 12 ft. high; and *Libocedrus Doniana* from the same country is about as tall. There are several trees of the curious

Tasmanian genus *Athrotaxis*. Of the three species known the rarest is *A. selaginoides*, here a slender pyramid 25 ft. high; *A. laxifolia* is 20 ft. high, and *A. cupressoides* is also represented. Of the interesting genus *Podocarpus* there are several representatives at Tregrehan: *P. Totara* of New Zealand is 25 ft. high; *P. macrophylla* from Japan is 12 ft.; and *P. chilina* is 30 ft. high, very graceful and beautiful, but scarcely so fine as the noted tree at Penjerrick. Closely allied to the Podocarps are *Prumnopitys elegans*, here 25 ft. high, and *Saxegothea conspicua*, 20 ft., both Chilean. Native of the same region is *Fitzroya patagonica* of which there is a spreading bushy tree 26 ft. in height, its trunk 3 ft. 10 in. round, very graceful because of the long pendulous terminal parts of the branches.

Apart from rhododendrons the most notable Himalayan plants at Tregrehan are an *Ilex insignis* 30 ft. high, its stem 1 ft. 3 in. in girth, one of the noblest of hollies; *Tsuga Brunoniana*, rarest of hemlocks, its trunk 4 ft. in girth; *Berberis asiatica*, 18 ft. high, its stem 2 ft. 3 in. round, a species allied to the well-known *B. aristata*, but with larger, harder leaves glaucous beneath and much more tender; and *Euonymus fimbriatus*, only known further north as a small bush in greenhouses, but here a small tree of shapely pyramidal form 22 ft. high, its trunk 4 ft. in circumference. There is also a good specimen of an oak one very rarely sees, the Himalayan *Quercus semicarpifolia*; it is evergreen and a large-leaved ally of *Q. Ilex*.

One of the most remarkable of evergreens in this garden is a plant of *Daphniphyllum glaucescens*, a large bush with rhododendron-like leaves and 20 ft. high by 24 ft. in diameter. Two Japanese hollies also are noteworthy: *Ilex cornuta*, 10 ft. high and 15 ft. through, and *I. crenata* 12 ft. in height. *Photinia serrulata* is a tree 35 ft. high and 45 ft. in diameter, notable for its red fruits and the bronzy red of its young foliage.

A tree of great interest is a specimen of *Eucalyptus cordata*. This, which I was told was planted less than thirty years ago, is now about 60 ft. high, its trunk 5 ft. in girth, dimensions considerably in excess of any recorded by Elwes in connection with this species in this country. It is one of the most striking features of this garden with its smooth tapering trunk and conspicuous head of glaucous foliage. It flowers very abundantly, even in the young state. Unlike most eucalypts, *E. cordata* does not change the character of its foliage in passing from the juvenile to the adult stage. *Panax longissimum*, that curious New Zealand tree with leaves 2 ft. long but only 1 in. to 2 in. wide, the midrib rich yellow, the margins coarsely toothed, is 15 to 20 ft. high. *Drimys aromatica*, not uncommon in the south-west, is 10 ft. high and 8 ft. through.

The trees and shrubs here mentioned by no means exhaust the interest of Tregrehan. A visit of two hours, such as mine, was not sufficient to examine adequately all its treasures. But enough perhaps has been written to show that few places can claim to possess so many exotic species of trees of so high an average of distinction, together with so many that may be regarded as the best of their kind in these islands.

XXVI.—MISCELLANEOUS NOTES.

Botanical Magazine for June.—The plants figured are *Aloe arborescens* var. *natalensis*, Berger, from Natal (t. 8663); *Saxegothaea conspicua*, Lindl., from Chile (t. 8664); *Rhododendron charianthum*, Hutchinson, from Western China (t. 8665), and *Campanula Zoysii*, Wulf, from North Italy and Austria (t. 8666).

The Fruit of Soyauxia.—The genus *Soyauxia* was referred by Oliver,* who described it, "to a group of erect *Passifloreae*† almost confined to West Tropical Africa," and was regarded by him "as connecting these with *Samydaceae* through *Dissomeria*." Warburg transferred this group to the *Flacourtiaceae* as a new tribe *Paropsieae*,‡ which included two sub-tribes: *Soyauxieae*, based on *Soyauxia*, and *Euparopsieae*, including the remaining genera.§

Gilg recognised three species‖ of *Soyauxia* in his account of African *Flacourtiaceae*,¶ and two more have been described recently.**

1, open fruits; 2, fruiting calyx, showing corky decurrent pedicel; 3 and 4 valves; 5, seed, showing depression above micropyle; 6 and 7, seeds showing raphe and micropyle respectively; 8, longitudinal section of seed; 9, embryo.—1 and 5 natural size, the remainder enlarged.

The fruit of *Soyauxia* has hitherto been known only from the description†† of *S. grandifolia*: "*Capsula* pedicello valde incrassato semigloboso insidens, basi calyce persistente cincta, valvis 3 late obovatis duris 1 poll. longis fere 1 poll. latis dehiscens." A fine series of fruiting specimens of an apparently undescribed species of *Soyauxia* has been collected in Sierra Leone by Mr. H. N. Thomas, and a more complete description of the fruit and seed of *Soyauxia* can now be given:

* Hook. Ic. Pl. t. 1393 (1882).
† *Paropsia*, *Smeathmannia* and *Barteria*.
‡ Engl. and Prantl, Nat. Pflanzenfam. vol. iii. 6A, p. 25 (1893).
§ *Hounea*, *Paropsia* (incl. *Smeathmannia*), *Paropsiopsis* and *Barteria*.
‖ *S. gabonensis*, *S. glabrescens*, *S. grandifolia*.
¶ Engl. Jahrb. vol. xl. p. 469 (1908).
** *S. Talbotii*, E. G. Baker in Journ. Bot. 1914, p. 4; *S. floribunda*, Hutchinson in Kew Bull. 1915, p. 44.
†† Journ. Linn. Soc. Bot. vol. xxxvii. p. 102 (1905).

Capsula basi calyce persistente cincta, monosperma, ab apice fere ad basin in valvas tres dehiscens; valvae stylorum cicatricibus alternantes, demum saepius recurvae, a medio ad basin et fere ad apicem in duo segmenta longitudinaliter findentes. *Semen* albuminosum, pendulum, trigonum, a latere visum anguste oblongum, laeve, nitidulum, micropyla basi foveae circularis supra medium seminis sita; albumen corneum, copiosum; embryo longitudine $\frac{1}{4}$–$\frac{1}{3}$ seminis metiens, radicula a micropyla descendente cum cotyledonibus angulum magnum efficiente.

The valves of the capsule bear half a style-scar at each side of their apex. They apparently open elastically, probably no resemblane to the pitted seeds of the *Euparopsieae*, and it is seed, with its basin-shaped depression above the micropyle, bears shooting out the seed in the process. The large smooth trigonous evident that the relationship with this group has been exaggerated. *Soyauxia* was known to differ from the *Euparopsieae* in its inflorescence, anthers, stigmas, placentation and small number of ovules; and now that its peculiar seeds are known, it is evident that the tribe *Paropsieae* should be restricted to the *Euparopsieae*, and the *Soyauxieae* should be accorded the status of a tribe.

T. A. S.

Presentation by Mrs. W. Paul Wood.—Parry's third Arctic Expedition (1824–25) yielded not inconsiderable botanical results, although in number of species it did not come up to the two preceding ones. This was due to the few opportunities that were afforded for officers to go on shore and the extreme poverty of the soil in the places visited. Parry's winter quarters were on this occasion at Port Bowen, at the extreme north of Baffinsland, and the plants collected came from Port Bowen, North Devon (Cape Warrender) and North Somerset. Some of them are attributed to Lieutenant Ross, but in most cases no collector's name is given. A portion of them were deposited in Hooker's herbarium and are now at Kew, mostly without exact indication of the station where they were collected. The plants enumerated comprised 66 phanerogams, 1 fern, 1 lycopodium, 3 mosses and 12 lower cryptogams. A few weeks ago another set of plants collected on the same expedition came to hand. They are in excellent condition, and in each case the locality is given. Kew owes this interesting contribution to the generosity of Mrs. W. Paul Wood, of Bath, who is now in her 89th year, but still takes interest in the little collection of Arctic plants which many years ago was given into her charge. It consists of 41 phanerogams, 1 lycopodium, and several mosses. They are all contained in Hooker's list, and are mostly from the same localities. Although they do not extend our knowledge of that far northern vegetation, they are nevertheless a valuable addition to the Kew collections, in as far as they supplement the incomplete set in the possession of Kew and are generally better specimens. Who the collector may have been has so far not been ascertained.

O. S.

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XXVII.—AFRICAN ANONACEAE.

T. A. Sprague and J. Hutchinson.

The great increase in our knowledge of the Tropical African flora since the publication of the first volume of the Flora of Tropical Africa is well illustrated by the family *Anonaceae*. In 1868 only 13 genera and 59 species of *Anonaceae* were known from Tropical Africa, whereas in 1901 there were 23 genera and 170 species recorded. At the present date 27 genera are known.

An illustrated monograph of African *Anonaceae* by Engler and Diels was published in 1901,* and supplementary papers by Diels appeared in 1907, 1908 and 1915.† Two new genera were described by E. G. Baker in 1913,‡ and one by De Wildeman in 1914.§

Whilst identifying the *Anonaceae* of a large collection received from Mr. N. W. Thomas, Government Anthropologist, Sierra Leone, the writers experienced considerable difficulty in determining the more critical genera owing to the lack of a workable key. Engler and Diels have given a conspectus of the genera of *Anonaceae* arranged in sub-families, tribes and sub-tribes, but there is so little contrast in the characters of the groups, that it is difficult to determine the genera in many cases. The key to the African genera given by Thonner‖ has the same drawback, though to a less extent. An artificial key to the African genera has therefore been prepared, in which prominence has been given to the more readily ascertainable characters. This is supplemented by a list of the less common characters and the genera in which they occur.

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* Engler, Monogr. Afr. Pfl. vol. vi. (1901).

† Engl. Jahrb. vol. xxxix. pp. 469–486; l.c. xli. pp. 323–329; l.c. liii. pp. 434–448.

‡ Catalogue of Talbot's Nigerian Plants, pp. 2, 5 (1913).

§ Fedde, Repert. vol. xiii. p. 383 (1914).

‖ Die Blütenpflanzen Afrikas, p. 218 (1908).

(4474.) Wt. 71—728. 1,125. 7/16. J. T. & S., Ltd. G. 14.

It has been found necessary to revise the generic limits of *Cleistopholis*, *Unona* and *Uvaria* as extended by Engler and Diels, and to transfer several species from them to *Oxymitra* and *Uvariastrum*. These transferences are discussed under the genera in question. A few new species are also described. In order to facilitate reference, the genera dealt with are arranged alphabetically.

CLAVIS GENERUM AFRICANORUM ANONACEARUM.

Indumentum lepidotum ... ... *Meiocarpidium.*
Indumentum haud lepidotum :—
  Inflorescentia oppositifolia ; rhachis incrassata, adunca ... ... *Artabotrys.*

  Rhachis haud adunca :—
    Gynoecium syncarpum ovario uniloculari :—
      Petala biseriata, exteriora interdum basi connata ... ... *Monodora.*
      Petala uniseriata, connata ... ... *Isolona.*
    Gynoecium apocarpum, sed pistilla a juventute concrescentia :—
      Indumentum stellatum ; petala valde imbricata ; ovula numerosa ... ... *Pachypodanthium.*
      Indumentum haud stellatum ; ovula solitaria : —
        Rhipidium pluriflorum ; flores bracteolis binis oppositis basi connatis instructi *Anonidium.*
        Inflorescentia 1–2-flora ; bracteolae solitariae ... ... *Anona.*
    Gynoecium apocarpum pistillis inter se liberis :—
      Corolla gamopetala :—
        Flores dimeri ; connectivum ultra thecas haud productum ... ... *Uvariopsis.*
        Flores trimeri ; connectivum ultra thecas productum :—
          Petala tranverse plicata ... ... *Hexalobus.*
          Petala haud transverse plicata ... *Asteranthe.*
      Corolla polypetala :—
        Petala 3 :—
          Flores dioici, longipedunculati, in trunco fasciculati ... ... *Thonnera.*
          Flores hermaphroditi, e ramulis orti :—
            Petala sepalis opposita ... ... *Enantia.*
            Petala sepalis alternantia ... ... *Dennettia.*
        Petala 4 vel 6, uniseriata, valvata :—
          Flores dioici ; petala 4 ; stamina numerosissima ... ... *Tetrastemma.*
          Flores hermaphroditi ; petala 6 ; stamina 12 ... ... *Monanthotaxis.*

Petala 6, biseriata :—
Petala interiora exterioribus sepaloideis multo longiora ; ovaria stigmate communi conjuncta :—
Flores fasciculati ... ... *Brieya.*
Flores haud fasciculati ... ... *Piptostigma.*
Petala interiora exterioribus haud longiora :—
Antherae locellatae ; styli in conum centralem conniventes ... *Xylopia.*
Antherae haud locellatae ; styli haud conniventes :—
Petala exteriora vel omnia in duas partes inferiorem concavam superiorem ligularem (appendicem dorsalem) divisa :—
Petala exteriora tantum appendice dorsali instructa *Stenanthera.*
Petala omnia appendice dorsali instructa :—
Petala interiora intus apice partis inferioris hamata... *Artabotrys aurantiodorus.*
Petala interiora haud hamata *Polyceratocarpus.*
Petala in partem inferiorem concavam et superiorem ligularem haud divisa :—
Petala saltem interiora imbricata :—
Petala exteriora patentia, plana, oblonga vel ligularia, interioribus cavis multo longiora ; stigma sessile, punctiforme, minutum ; ovula 1–2 ; semina tuberculata *Cleistopholis.*
Petala exteriora interioribus sat similia ; stigma sessile, conspicuum ; ovula numerosa ; semina laevia ; indumentum plerumque stellatum ... *Uvaria.*
Petala exteriora interioribus sat similia ; stylus saepius manifestus stigmate plerumque bilobo ; ovula 1–8 ; semina laevia *Popowia.*
Petala omnia valvata :—
Sepala petala in alabastro omnino obtegentia ; petala interiora a basi ad apicem contigua .... *Uvariastrum.*

Sepala petala in alabastro haud obtegentia vel, si obtegentia, petala interiora superne tantum contigua :—
Petala exteriora interioribus manifeste longiora ; petala interiora superne conniventia inferne interstitiis triangularibus separata ... ... *Oxymitra.*
Petala subaequilonga :—
Alabastra oblonga :—
Ovula 1–2 ; fructus stipitati, breves, recti ... ... *Polyalthia.*
Ovula numerosa ; fructus sessiles, elongati, valde arcuati ... ... *Polyceratocarpus.*
Alabastra subglobosa : —
Ovula 1–8 ; stigma plus minusve bilobum ... ... *Popowia.*
Ovula circiter 22 ; stigma pileatocapitatum ... *Alphonseopsis.*

CHARACTERS OCCURRING IN RELATIVELY FEW GENERA.

1. Hairy covering.

Peltate scales: *Meiocarpidium.*
Stellate hairs: *Uvaria* (exc. sect. *Uvariodendron*), *Pachypodanthium*, *Enantia polycarpa.*

2. Inflorescence.

Distinct, several-flowered inflorescences with well-developed rhachis: *Anonidium*, *Piptostigma*, *Artabotrys*, *Oxymitra albida*, *Monanthotaxis.*
Hooked rhachis: *Artabotrys* (exc. *A. aurantiodorus*).
Cauliflory: *Uvaria* sect. *Uvariodendron*, *Uvariastrum Zenkeri*, *Tetrastemma*, *Thonnera.*

3. Flowers.

Dimerous: *Uvariopsis*, *Tetrastemma.*
Unisexual: *Tetrastemma*, *Thonnera*, *Uvariopsis*, *Anonidium*, *Polyalthia* spp., *Popowia* spp.

4. Corolla.

Gamopetalous: *Asteranthe*, *Uvariopsis*, *Hexalobus*, *Isolona*, *Monodora* spp.
Petals 3: *Enantia* (opposite the sepals), *Dennettia* (alternate with the sepals), *Thonnera.*
Petals 4: *Tetrastemma*, *Uvariopsis*, *Monanthotaxis.*
Petals imbricate (both whorls or only the inner one):

Uvaria, Asteranthe, Pachypodanthium, Cleistopholis, Anonidium, Popowia spp.

Petals transversely plicate: *Hexalobus.*

Petals dorsally appendaged: *Stenanthera, Xylopia, Artabotrys.*

Inner petals much larger than the outer: *Piptostigma, Brieya.*

5. Androecium.

Stamens definite: *Monanthotaxis* (12), *Popowia* spp.

Anthers locellate: *Xylopia.*

Connective not produced beyond the thecae: *Thonnera, Tetrastemma, Uvariopsis.*

6. Gynoecium.

Syncarpous, with parietal placentation: *Isolona, Monodora.*

Apocarpous, with concrescent pistils: *Anonidium, Pachypodanthium, Anona.*

Ovaries united by a common stigma: *Piptostigma, Brieya.*

Styles connivent in a central cone: *Xylopia.*

7. Seeds.

Tuberculate: *Cleistopholis.*

Artabotrys hispida, sp. nov.; affinis *A. velutino*, Scott Elliot, sed ramulis hornotinis pilis patulis densiuscule hispidis, foliis acuminatis basi rotundatis, pedunculis subunifloris, petalis multo longioribus differt.

Rami annotini teretes, circiter 4 mm. diametro, patule hispidi, demum glabri vel fere glabri; ramuli hornotini laxe foliati, breves, 1·25 mm. diametro, pilis patulis brunneis densiuscule hispidi; gemmae terminales ambitu lineari-lanceolatae, subacutae, 8 mm. longae, dense sericeo-villosae. *Folia* oblonga vel oblongo-elliptica, basi rotundata, apice subabrupte et obtuse acuminata (acumine 5 mm. longo), 4-8·5 cm. longa, 1·7-3 cm. lata, chartacea, supra glabra et minutissime punctulata, infra reticulata, praecipue in costa media brunneo-pilosa; costa supra plana, infra prominens; nervi laterales utrinsecus 8-10, a costa sub-angulo lato abeuntes, intra marginem prominenter conjuncti et ramosi, supra leviter prominuli, infra subprominentes; petioli 2-2·5 mm. longi, dense hispidi. *Pedunculi* oppositifolii, subuniflori, 1-1·5 cm. longi, recurvati et incrassati, hirsuti. *Sepala* 3, ovato-triangularia, acuta, 3 mm. longa, 1·75-2 mm. lata, extra parce pilosa, intra glabra. *Petala* aequalia, e basi late ovato intra concavo 2 mm. longo 2·25 mm. lato linearia, subteretia, obtusa vel subacuta, 1·2 cm. longa, medio 0·75 mm. crassa, ad apicem leviter attenuata, breviter appresse pubescentia. *Stamina* circiter 20; antherae subsessiles; thecae 0·75 mm. longae, connectivo apice peltato plano circiter 0·75 mm. diametro glabro. *Carpella* 6, sessilia, leviter obliqua, 1 mm. longa, glabra, 2-ovulata, ovulis collateralibus erectis, stigmate linguiformi patulo subelliptico 0·5 mm. longo glabro coronata. *Torus* dense villoso-hirsutus. *Fructus* non visus.

Distrib. Sierra Leone: Roruks, Nov., fl., *Thomas* 5770.

Cleistochlamys, *Oliv.* in Journ. Linn. Soc. vol. ix. p. 175; Fl. Trop. Afr. vol. i. p. 24.*

Oliver stated that the salient characters of *Cleistochlamys* were: "the sepals wholly connate, forming a closed, at length vertically ruptured calyx; the imbricate inner petals (which with the truncate anthers place it in the tribe Uvarieae), and the very small, usually solitary, axillary, sessile flowers." The genus has been recognised by all subsequent writers, but is inseparable from the group of African species referred to *Popowia* by Engler and Diels. The fact that the calyx is closed in the young bud cannot be considered as a generic character: a closed calyx is characteristic of the young flower-buds of *Uvaria Chamae*, Beauv.; this opens at the top, and remains as a cup round the petals for a considerable time, finally separating more or less into lobes; whereas in other species of *Uvaria* the sepals are more or less free from an early stage. The period at which the sepals separate from one another depends largely on the size of the petals relatively to the sepals.

Imbricate inner petals occur in some of the African† species of *Popowia* (e.g., *P. gracilis*, Oliv.). Engler and Diels mention this fact in their conspectus of genera (l.c. 5), but omit it from the diagnosis of *Popowia* (l.c. 43), in which they describe the petals as valvate.

The facies of *Cleistochlamys Kirkii* and the form of the stamens and pistils are quite those of a *Popowia*,‡ and we accordingly restore it to this genus in which it was originally placed by Bentham. The synonymy and geographical distribution are given under *Popowia*.

Cleistopholis, *Pierre ex Engler* in Engl. & Prantl., Nat. Pflanzenfam. Nachtr. p. 160 (1897); Engl. & Diels in Engl. Monogr. Afr. Pfl. vol. vi. p. 33, excl. spp.; Diels in Engl. Jahrb. vol. liii. p. 439; *Oxymitra*, Baillon, Hist. Pl. vol. i. pp. 235, 286, ff. 282, 283, quoad *O. patens*.

A very distinct genus characterised by oblong outer petals, much shorter, more or less imbricate inner petals, biovulate or uniovulate pistils, sessile stigmas and tuberculate seeds. Engler and Diels, l.c. 34, included three species§ which differ from their own definition of *Cleistopholis* in possessing ovate or ovate-lanceolate outer petals, and valvate inner petals connate above. These are now transferred to *Oxymitra*. The following species are retained by us in *Cleistopholis*:—

1. **C. glauca,** *Pierre ex Engl. & Diels*, l.c. 35 (1901).
DISTRIB. Gaboon.

2. **C. Staudtii,** *Engl. & Diels*, l.c.; Diels in Engl. Jahrb. vol. liii. p. 439. *Oxymitra Staudtii*, Engl. & Diels in Notizbl. Bot. Gart. Berlin, vol. ii. p. 297 (1899). *Polyalthia crassipes*, Engl. in Engl. Jahrb. vol. xxxix. p. 477.
DISTRIB. Cameroons.

* For the remaining references see under *Popowia*, p. 156–7.
† *Popowia Kurzii*, King, a native of the Andaman Islands and Burma, also has imbricate inner petals (King, Materials Fl. Mal. Penins. vol. i. p. 345).
‡ As understood by Engler and Diels.
§ *C. albida*, *C. gracilipes* and *C. platypetala*.

3. **C. myristiciflora,** *Diels & Mildbr.* in Engl. Jahrb. vol. liii. p. 439 (1915).

Distrib. Cameroons.

4. **C. patens,** *Engl. & Diels* in Engl. Monogr. Afr. Pfl. vol. vi. p. 35. *Oxymitra patens*, Benth. in Trans. Linn. Soc. vol. xxiii. p. 472, t. 51; Oliv. Fl. Trop. Afr. vol. i. p. 34.

Distrib. Sierra Leone to Gaboon.

5. **C. Klaineana,** *Pierre ex Engl. & Diels*, l.c. 35, t. 13, A (1901).

Distrib. Gaboon.

6. **C. grandiflora,** *De Wild.* in Ann. Mus. Congo, Sér. 5, vol. i. p. 39, t. 21 (1903).

Distrib. Lower Congo.

Cleistopholis discostigma, Diels in Engl. Jahrb. vol. xxxix. p. 474 (1907), differs from all the other species in its sepals and petals being all alike, and should be excluded from the genus. There are no flowers on the Kew specimen. Diels originally stated that it was allied to *C. glauca*, Pierre, but subsequently (l.c. liii. p. 439) mentioned that *C. albida*, Engl. et Diels, was apparently its nearest ally. It is, therefore, probably a species of *Oxymitra*.

Isolona, *Engl.* in Engl. & Prantl. Nat. Pflanzenfam. Nachtr. i. p. 161 (1897); Engl. & Diels in Engl. Monogr. Afr. Pfl. vol. vi. p. 82.

Isolona differs from *Monodora* in its uniseriately arranged petals united into a gamopetalous corolla. It is endemic in Africa. Seven species were described by Engler and Diels, l.c., and six more have been published recently.* The following species appears to be new:—

I. leonensis, sp. nov., corolla parva glabra, lobis triangulari-lanceolatis quam tubo sesqui-vel subduplo-longioribus distincta.

Rami leviter flexuosi, subteretes, circiter 3·5 mm. crassi, longitudinaliter verruculosi, cinereo-brunnei vel nigrescentes; ramuli juniores graciles, paullum flexuosi, sicco plerumque nigrescentes, angulares, conspicue nigro-verrucosi. *Folia* oblonga vel oblongo-oblanceolata, obtuse et longe acuminata, basi abrupte et anguste cuneata, 8–15 cm. longa, 2–5 cm. lata, utrinque saepe nitidula, glabra, conspicue et laxe reticulata; costa media utrinque prominens, basi circiter 1 mm. lata, ad laminae apicem sensim attenuata; nervi laterales utrinsecus 8–10, a costa sub angulo lato abeuntes, arcuati, circiter 1 cm. intra marginem conjuncti, inter juncturas et marginem valde ramosi; petioli 2–3 mm. longi, 1·5–1·75 mm. crassi, arcte verrucosi, nigri. *Flores* pauci, prope basin ramulorum juniorum axillares, solitarii; pedicelli 1–1·5 cm. longi, graciles, basi bracteis duabus oppositis medio bracteola

* *I. leucantha*, Diels, and *I. pleurocarpa*, Diels in Engl. Jahrb. vol. xxxix., p. 484 (1907), et l.c. liii. p. 447 (Cameroons); *I. pilosa*, Diels, l.c. xli. p. 328 (1908), et l.c. liii. p. 448 (Belgian Congo and Cameroons); *I. Bruneelii*, De Wild., *I. Sereti*, De Wild., *I. Solheidii*, De Wild. in Ann. Mus. Congo, Sér. 5, vol. iii. p. 82 (1909) (Belgian Congo).

solitaria instructi, nigri, dense verrucosi; bracteae oblongae, obtusae, circiter 1 mm. longae, glabrae. *Sepala* ovato-rotundata, 3·5 mm. longa et lata, trinervia, minute verrucosa. *Corolla* glabra; tubus inferne depresso-globosus, medio constrictus, superne in limbum 6-lobatum expansus, 4 mm. longus, medio circiter 3·5 mm. diametro; lobi subaequales, patentes, triangulari-lanceolati, acuti, 5–7 mm. longi, basi 2·5–3·5 mm. lati, subconspicue trinervii. *Stamina* numerosa; antherae subsessiles, 0·75 mm. latae; thecae distinctae, 0·5 mm. longae, connectivo apice ampliato et complanato ambitu transverse oblongo-elliptico. *Stigma* antheras superans, capitatum, 1 mm. altum, 1·75 mm. diametro, verruculosum. *Fructus* lobulatus, ovoideus vel oblongo-ovoideus, 4-5 cm. longus, 2–3 cm. diametro, sicco niger, lobulis verrucosis; pedicelli fructiferi leviter curvati, 1·5–2 cm. longi, 1·75–2·5 mm. crassi.

Distrib. Sierra Leone: Sendugu, fl. June, *Thomas* 687; Yonibana, *Thomas* 4230, 4259, 4690, 4962; Mamaha, *Thomas* 4593, 4648—found in both flower and fruit in October and November.

Isolona leonensis, Sprague et Hutchinson.
A, portion of flowering shoot, nat. size; B, stamens and pistil, × 4; C, stamen, × 10; D, fruit, nat. size.

Oxymitra, *Hook. f. & Thoms.* Fl. Ind. vol. i. p. 145 (1855); Benth. & Hook. f. Gen. Pl. vol. i. p. 26; King in Ann. Bot. Gard. Calcutta, vol. iv. part 1, p. 123. *Polyalthia*, sect. *Oxymitra*, Blume, Fl. Jav. Anonac. p. 71 (1828). *Unona*, Engl. & Diels in Engl. Monogr. Afr. Pfl. vol. vi. p. 39, excl. citationibus genericis, descriptione et *U. Stuhlmannii;* non Linn. f.

To *Oxymitra* we refer four out of the five African species included by Engler and Diels in *Unona*, in addition to three which they placed in *Cleistopholis* (*C. albida*, *C. gracilipes* and *C. platypetala*).

As Safford has pointed out,* *Unona*, Linn. f., is a synonym of *Xylopia;* and the Asiatic species hitherto included under *Unona* are referable to *Desmos*, Lour., and *Dasymaschalon*, Dalle Torre & Harms.

Engler and Diels, l.c., stated that the sole difference between *Popowia* (sensu latiore) and "*Unona*" [=*Desmos*] is that the inner petals are erect and connivent in the former, spreading in the latter; but four of the five species included by them in "*Unona*" have connivent petals, and should therefore, on their own showing, be placed in *Popowia*.

Popowia, however, has the inner petals free from one another† and often slightly imbricate,‡ whereas the species under consideration have valvate inner petals connate above into a cone and separated below by subtriangular window-like spaces through which the stamens may be seen. A corolla of this kind is characteristic of *Goniothalamus* and *Oxymitra*. These two genera are so closely allied that it is difficult to find technical characters to separate them. According to King, the inner petals are clawed in *Goniothalamus*, not clawed in *Oxymitra*, and the lateral nerves form intramarginal loops in the former but not in the latter. *Goniothalamus* also appears to have a more or less elongated style, whereas the Indian species of *Oxymitra* have a short style, or none. The character of clawed or not clawed petals hardly seems to hold good. On the whole, it seems best to refer the African species under consideration provisionally to *Oxymitra*, on account of the nature of their venation, while recognising that they belong to several different natural groups, which may eventually have to be treated as distinct genera when their characters are better known.

O. albida, *O. longipedicellata* and *O. gracilipes* have distinct styles and subcylindric fruits§. *O. gracilis*, *O. rosea*, *O. Soyauxii* and *O. montana*, on the other hand, have sessile or subsessile capitate stigmas and moniliform fruits (biarticulate or ellipsoid in *O. Soyauxii*). Another type is represented by *O. hirsuta* and *O. velutina*, which have relatively narrow, long, accuminate inner petals, and sausage-shaped, 1-seeded (rarely 2-seeded) fruits. The African species referred by us to *Oxymitra* are the following:—

1. **O. albida.**—*Unona albida*, Engl. in Notizbl. Bot. Gart.

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* Bull. Torr. Bot. Club, 1912, vol. xxxix. p. 504.
† King in Ann. Bot. Gard. Calcutta, vol. iv. part 1, p. 116.
‡ Engl. Monogr. Afr. Pfl. vol vi. p. 5.
§ Only known in *O. longipedicellata.*

Berlin, vol. ii. p. 297 (1899). *Cleistopholis albida*, Engl. & Diels in Engl. Monogr. Afr. Pfl. vol. vi. p. 34, t. 12A.

DISTRIB. Cameroons.

2. **O. longipedicellata,** sp. nov.; affinis *O. albidae*, Sprague & Hutchinson, a qua sepalis inferne plus minusve confluentibus, petalis exterioribus pro rata angustiora, staminibus pistillisque subduplo paucioribus, necnon pedicellis longioribus recedit.—*Cleistopholis albida* var. *longipedicellata*, E. G. Baker in Cat. Talbot's Nigerian Pl. p. 3 (1913).

Sepala ovato-deltoidea, apiculata, basi plus minusve connata, 2–2·5 mm. longa, 3·5 mm. lata. *Petala* exteriora anguste cordato-ovata, 8–9 mm. longa, 5mm. lata; petala interiora ovato-lanceolata, acuta, ungue brevi horizontali incluso 6·5 mm. longa, vix 3·5 mm. lata, 3–4 mm. contigua. *Stamina* circiter 65. *Pistilla* circiter 24.

DISTRIB. Southern Nigeria.

3. **O. gracilipes,** *Benth.* in Trans. Linn. Soc. vol. xxiii. p. 471 (1862). *Cleistopholis gracilipes*, Engl. & Diels in Engl. Monogr. Afr. Pfl. vol. vi. p. 34.

DISTRIB. Fernando Po.

4. **O. gracilis.**—*Uvaria gracilis*, Hook. f. in Hook. Niger Fl. 210 (1849); Oliv. Fl. Trop. Afr. vol. i. p. 22; Engl. & Diels in Engl. Monogr. Afr. Pfl. vol. vi. p. 22. *Oxymitra platypetala*, Benth. in Trans. Linn. Soc. vol. xxiii. p. 472 (1862); Oliv. l.c. 33. *Cleistopholis platypetala*, Engl. & Diels, l.c. 34. *Unona Millenii*, Engl. & Diels, l.c. 40.

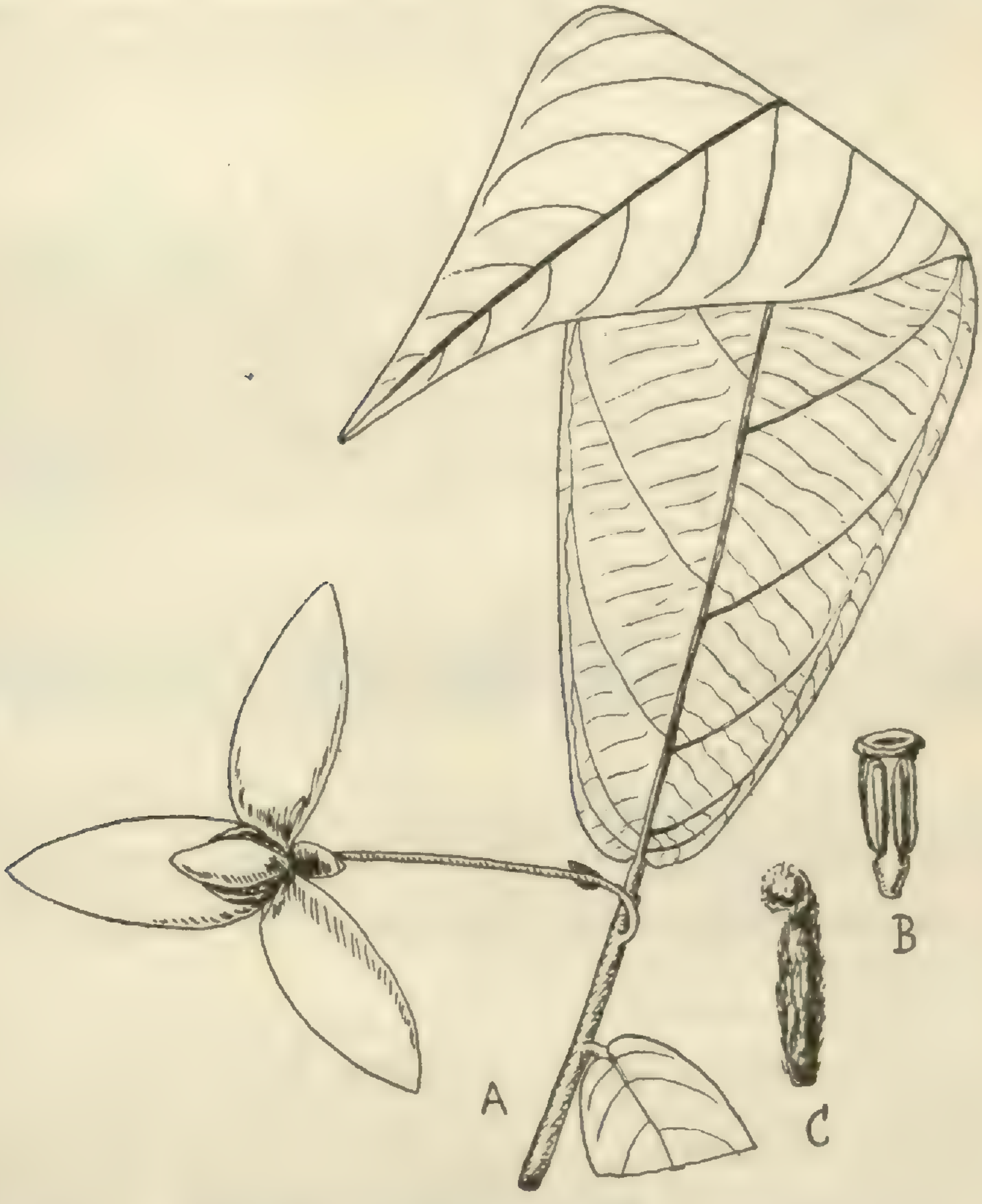
DISTRIB. Sierra Leone, Lagos.

5. **O. rosea,** sp. nov.; affinis *O. gracili*, Sprague & Hutchinson, foliis subcaudato-acuminatis, petalis exterioribus longioribus ovato-lanceolatis differt.

Ramuli leviter flexuosi, graciles, cortice cinereo glabrescente prominenter lenticellato obtecti. *Folia* obovato-oblonga vel oblonga, apice longe subcaudato-acuminata, subobtusa, acumine 1-2·5 cm. longo, basi rotundata et paulum auriculata, 7-14 cm. longa, 2·5-4·5 cm. lata, tenuiter chartacea, glabra vel infra minutissime pubescentia, infra plus minusve glauca; costa media supra impressa, infra prominens, verruculosa et interdum minute et adpresse pubescens; nervi laterales utrinque 9-11, leviter arcuati, a costa sub angulo 60°–70° abeuntes, supra distincti, infra prominentes, intra marginem flexuosi et conjuncti; nervi tertiarii utrinque prominuli, subparalleli; petioli 2-4 mm. longi. *Flores* supra-axillares, solitarii; pedicelli graciles, 1·5-2·5 cm. longi, minute puberuli, basin versus bractea ovata obtusa 1·25 mm. longa muniti. *Sepala* mox reflexa, ovata vel ovato-lanceolata, subobtusa, circiter 3·5 mm. longa et 2·5 mm. lata, coriacea, glabrescentia. *Petala* exteriora patentia, ovato-lanceolata, subobtusa, 2 cm. longa, plerumque circiter 1 cm. lata, coriacea, utrinque puberula; petala interiora conniventia, elliptico-rhomboidea, obtusa, 1 cm. longa, 0·5 cm. lata, coriacea, extra puberula. *Stamina* numerosa; filamenta 0·3–0·4 mm.

longa; thecae 0·75 mm. longae, connectivo plano ampliato glabro. *Carpella* numerosa, subclavata, 3–4 mm. longa, dense adpresse brunneo-setulosa, stigmate sessili magno capitato grosse papilloso coronata. *Ovula* 5.

Distrib. Southern Nigeria: Oban, *Talbot* 199 (Herb. Mus. Brit.).



Oxymitra rosea, Sprague et Hutchinson.

A, part of flowering shoot, nat. size; B, stamen, × 10; C, carpel, × 5.

6. **O. Soyauxii.***—*Unona glauca*, Engl. & Diels in Notizbl. Bot. Gart. Berlin, vol. ii. p. 296 (1899); Monogr. Afr. Pfl., vol. vi. p. 40.

Distrib. Gaboon, Belgian Congo.

7. **O. montana.**—*Unona montana*, Engl. & Diels in Notizbl. Bot. Gart. Berlin, vol. ii. p. 296 (1899); Monogr. Afr. Pfl., vol. vi. p. 40.

Distrib. Cameroons.

8. **O. hirsuta.**—*Unona hirsuta*, Benth. in Trans. Linn. Soc. vol. xxiii. p. 469 (1862); Oliv. Fl. Trop. Afr. vol. i. p. 35; Engl. et Diels in Engl. Monogr. Afr. Pfl. vol. vi. p. 39.

Distrib. Sierra Leone (*Scott Elliot* 4854), Fernando Po.

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* Specific name changed on account of the pre-existing *O. glauca*, Hook. f. et Thoms., a native of the Malay Peninsula and Sumatra.

9. **O. velutina,** sp. nov.; affinis *O. hirsutae,* Sprague & Hutchinson, sed foliis ad basin angustatis apice breviter acuminatis, monocarpiis adpresse velutinis nec hispidis differt.

Ramuli flexuosi, rufo-tomentelli vel tomentosi. *Folia* oblongo-elliptica vel oblongo-oblanceolata, breviter et obtuse acuminata, in basin cordatam vel subauriculatam leviter angustata, 9–18 cm. longa, 3–6·5 cm. lata, chartacea, supra costa hirsuta excepta glabra, infra rufo-pilosa; costa media infra prominens, velutino-tomentosa; nervi laterales utrinque 11–13, a costa sub angulo circiter 60° abeuntes, prope marginem curvati et obscure conjuncti, supra distincti, infra prominentes; nervi tertiarii numerosi, paralleli, infra conspicui; petioli robusti, 3–6 mm. longi, dense velutino-tomentosi. *Pedicelli* supra-axillares vel oppositifolii, circiter 1 cm. longi, circiter 1·5 mm. crassi, velutino-tomentosi. *Sepala* demum reflexa, ovata, obtusa, 3–4 mm. longa, 4 mm. lata, coriacea, intra parce puberula, extra breviter tomentosa. *Petala* exteriora ovato-lanceolata, obtusa, 1–1·3 cm. longa, 5–6 mm. lata, coriacea, extra tomentella, intra dense puberula; petala interiora oblanceolata, subacuta, 7 mm. longa, circiter 2·5 mm. lata, coriacea, utrinque puberula. *Antherae* circiter 1 mm. longae. *Ovaria* non visa. *Monocarpia* 1–2-sperma, breviter stipitata, oblonga, teretia, apiculata, rarius subglobosa, 2–4 cm. longa, circiter 1 cm. crassa, dense adpresso-velutina. *Semina* leviter compressa, usque ad 2 cm. longa et 7 mm. lata.

Distrib. Sierra Leone: Yonibana, Nov., fr., *Thomas* 4701; 5005. Makump, July, fr., *Thomas* 968.

10. **O. obanensis.**—*Uvaria obanensis,* E. G. Baker in Cat. Talbot's Nigerian Pl., p. 1 (1913).

Distrib. Southern Nigeria.

11. **O. Dielsiana.**—*Unona Dielsiana,* Engl. in Engl. Jahrb. vol. xxxix. p. 476 (1907).

Distrib. Cameroons.

Cleistopholis discostigma, Diels, is probably an *Oxymitra,* since Diels states that it is allied to *C. albida.** We have not seen the flowers.

Popowia, *Endl.* Gen. Pl. p. 831 (1839); Benth. & Hook. f. Gen. Pl. vol. i. p. 25; Baillon, Adansonia, vol. viii. pp. 314, 339; Hist. Pl. vol. i. pp. 219, 284; Engl. & Diels in Engl. Monogr. Afr. Pfl. vol. vi. p. 43. *Clathrospermum* (sphalm. *Clethrosperum*), Planch. in Hook. Ic. Pl. sub t. 767 (1848); Benth. in Hook. Niger Fl. p. 209, in adnot.; Benth. & Hook. f. Gen. Pl. vol. i. p. 29; Oliv. Fl. Trop. Afr. vol. i. p. 24. *Cleistochlamys,* Oliv. in Journ. Linn. Soc. vol. ix. p. 175 (1867); Fl. Trop. Afr. vol. i. p. 24; Benth. & Hook. f. Gen. Pl. vol. i. p. 956; Baillon, Hist. Pl. vol. i. pp. 206, 282; Engl. & Diels in Engl. Monogr. Afr. Pfl. vol. vi. p. 36.

To the diagnosis of the African species of this genus given by Engler and Diels it may be added that the inner petals are sometimes imbricate, and the stigma is sometimes sessile. The

* Engl. Jahrb. vol. liii. p. 439 (1915).

genus *Popowia* was founded by Endlicher on a Javan plant, *Bocagea pisocarpa*, Blume, Fl. Jav. Anonac. p. 90, t. 45; and judging from this plate and the illustrations of the Asiatic species given by King,* it is questionable whether the African species really belong to the same genus, and it may be necessary to restore the genus *Clathrospermum* to accommodate them.

The reasons for the reduction of the genus *Cleistochlamys* have already been explained. The synonymy and distribution of its only species are as follows:—

Popowia Kirkii, Benth. in Trans. Linn. Soc. vol. xxiii. p. 470 (1862). *Cleistochlamys Kirkii*, Oliv. in Journ. Linn. Soc. vol. ix. p. 175; Fl. Trop. Afr. vol. i. p. 24; Engl. & Diels in Engl. Monogr. Afr. Pfl. vol. vi. p. 36, t. 13 B; Diels in Engl. Jahrb. vol. liii. p. 440. *Unona parvifolia* var. *Petersii*, Engl. Pflanzenw. Ost-Afr. vol. C. p. 179.

Distrib. German East Africa, Portuguese East Africa.

P. littoralis, *Bagshawe & E. G. Baker* in Journ. Bot., July, 1908, p. 221. *P. Dawei*, Diels in Engl. Jahrb. vol. xli. p. 328 (Aug. 1908).

Distrib. Uganda.

P. littoralis was based on *Bagshawe* 629 from Buvuma Island and *Dawe* 191 from Busiro. *P. Dawei*, which was published a month later, was founded on *Dawe* 191.

P. sp. nov.—*Zenker* 3495 A (Cameroons), distributed as *Popowia Mannii*, is a new species, apparently allied to *P. filamentosa*, Diels. The flowers on the specimen in the Kew Herbarium are too young for description. They appear to be gyno-monoecious.

Unona, *auct.*, non Linn. f.

The type of the genus *Unona* is *U. discreta*, Linn. f.,† which was based on a tree collected in Surinam by Dalberg, and known by the vernacular name Peyricoboom. Dunal reduced the Asiatic genera *Melodorum*, Lour., and *Desmos*, Lour., to *Unona*;‡ and A. P. De Candolle still further enlarged the scope of the genus.§

Hooker and Thomson excluded the type species, and stated that *Unona* was entirely an Asiatic genus, although ascribing it to Linnaeus.‖ They recognised three sections comprising 13 species: 1, *Desmos*, with 6 petals, and carpels constricted between the seeds; 2, *Dasymaschalon*, with 3 petals, and carpels constricted between the seeds; and 3, *Pseudo-Unona*, with 6 petals, and unconstricted carpels. Bentham and Hooker gave the number of species as 18, including 4 or 5 African ones in addition to those recognised by Hooker and Thomson.¶

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* Ann. Bot. Gard. Calcutta, vol. iv. pt. 3, tt. 159–165.
† Suppl. p. 270 (1781).
‡ Monogr. Anonac. p. 42 (1817).
§ Syst. vol. i. p. 485 (1818); Prodr. vol. i. p. 88.
‖ Fl. Ind. vol. i. p. 130 (1855).
¶ Gen. Pl. vol. i. p. 24 (1862).

Safford has recently pointed out that *Unona discreta* is a *Xylopia*, and that the Asiatic species hitherto included in *Unona* should be referred to *Desmos*.* Other authors consider that the section *Dasymaschalon* should be treated as a distinct genus.†

As stated under *Oxymitra*, four of the five African species of *Unona* recognised by Engler and Diels‡ should be referred to *Oxymitra*. The remaining one, *U. Stuhlmannii*, Engl., seems to approach some of the species referred to *Popowia* by Engler and Diels. We have not seen a specimen.

Uvaria, *Linn.* Sp. Pl. ed. 1, p. 536 (1753); Gen. Pl. ed. 5, p. 240 (1754); Benth. et Hook f. Gen. Pl. vol. i. p. 23.

We adhere to the generic limits of *Uvaria* as defined by Bentham and Hooker, and exclude the American genera *Porcelia*, *Sapranthus* and *Asimina*, which Engler and Diels have treated as sections of *Uvaria*.§ Apart from the presence of an aril, to which Engler and Diels seem to attach no importance, the characters of the gynoecium are sufficient to distinguish *Asimina* from *Uvaria*, as may be seen by comparison of the figures of *Asimina* given by Sargent‖ and Hemsley¶ with those of *Uvaria* given by King** and Engler and Diels.†† As to *Porcelia* and *Sapranthus*, the investigations of R. E. Fries have shown that these two genera are not even congeneric with each other.‡‡

Uvaria Thomasii, sp. nov.; similis *U. bipindensi*, Engl., a qua ramulis strigoso-pilosis flores gerentibus differt.

Ramuli graciles, patule strigoso-pilosi, sicco verrucosi. *Folia* oblonga vel leviter obovato-oblonga, subsensim acuminata, acumine circiter 2 cm. longo, basi rotundata, 5·5–14 cm. longa, 2·5–5 cm. lata, tenuiter chartacea, supra parce setulosa, demum nervis hirsutis exceptis glabra, infra praecipue in costa et nervis patule pilosa; nervi laterales utrinque 9–15, supra prominuli, infra prominentes, a costa sub angulo 50°–60° abeuntes, marginem versus flexuosi et ramosi; veni laxe anastomosantes, infra prominuli; petioli 5 mm. longi, dense setosi. *Flores* supraaxillares, solitarii, brevissime pedicellati, circiter 2·5 cm. expansi. *Sepala* late ovata, mucronulata, 5 mm. longa, 6 mm. lata, extra stellato-tomentella. *Petala* subaequalia, oblongo-lanceolata, circiter 1·2 cm. longa, 6–7 mm. lata, utrinque dense rufo-tomentella. *Stamina* numerosa; thecae 1 mm. longae, connectivo subcapitato rufo-tomentoso. *Carpella* tomentosa. *Fructus* non visus.

Distrib. Sierra Leone: Sendugu, June, *Thomas* 569.

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* Bull. Torr. Bot. Club. vol. xxxix. p. 501 (1912).
† Dalle Torre et Harms, Gen. Siphonog. p. 174 (1901); Finet et Gagnep. Contrib. Fl. As. Or. fasc. ii. p. 141; Fl. Gén. Indo-Chine, vol. i. p. 104.
‡ Engl. Monogr. Afr. Pfl. vol. vi. p. 43 (1901).
§ Engl. Monogr. Afr. Pfl. vol. vi p. 7.
‖ Silva N. Am. vol. i. t. 15.
¶ Hook. Ic. Pl. t. 1514.
** Ann. Bot. Gard. Calcutta, vol. iv. tt. 4–28.
†† Engl. Monogr. Afr. Pl. vol. vi. tt. 1–8.
‡‡ Svensk. Vet.-Akad. Handl. vol. xxxiv. No. 5, p. 11 (1900).

Uvariastrum, *Engl.* in Engl. Monogr. Afr. Pfl. vol. vi. p. 31, t. 10, fig. B (1901).

The genus *Uvariastrum* was based by Engler on *U. Pierreanum*, Engl. (Gaboon), and was distinguished from *Uvaria* by the petals being all valvate, and the carpels being six in number or fewer, and from *Meiocarpidium* by the presence of simple hairs instead of peltate scales* (l.c. 5). In 1907 Engler and Diels described a new species, *U. Zenkeri* (Cameroons), and at the same time transferred *Uvaria dependens*, Engl. & Diels (Usambara) to *Uvariastrum*.† The last-mentioned species is described as having numerous carpels (l.c. 28).

The best distinguishing mark of *Uvariastrum* seems to have been overlooked by Engler and Diels, namely, that the sepals are truly *valvate* in *Uvariastrum*, whereas they are *open* in aestivation in *Uvaria* and *Meiocarpidium*. The genera *Uvaria*, *Meiocarpidium* and *Uvariastrum* may therefore be readily distinguished by means of the aestivation of their calyx and corolla and the nature of the indumentum:

1. *Uvaria*: sepals open in aestivation; at least the inner petals imbricate; stellate hairs present (except. sect. *Uvariodendron*).

2. *Meiocarpidium*: sepals open in aestivation; petals all valvate; indumentum of peltate scales.

3. *Uvariastrum*: sepals valvate; petals all valvate; hairs, when present, simple.

In accordance with these definitions, *Uvaria insculpta*, Engl. & Diels, and *Uvaria Elliotiana*, Engl. & Diels (l.c. 27, 28), should be transferred to *Uvariastrum*, bringing the number of known species up to five.

1. **U. Pierreanum,** *Engl.* in Engl. Monogr. Afr. Pfl. vol. vi. p. 32, t. 10, fig. B (1910).

Distrib. Gaboon.

2. **U. Zenkeri,** *Engl. & Diels* in Engl. Jahrb. vol. xxxix. p. 473 (1907).

Distrib. Cameroons.

3. **U. dependens,** *Engl. & Diels* in Engl. Jahrb. vol. xxxix. p. 474.—*Uvaria dependens*, Engl. & Diels in Engl. Monogr. Afr. Pfl. vol. vi. p. 28, t. 9.

Distrib. Usambara.

4. **U. insculptum.**—*Uvaria insculpta*, Engl. & Diels in Notizbl. Bot. Gart. Berlin, vol. ii. p. 295 (1899); Engl. Monogr. Afr. Pfl. vol. vi. p. 27, t. 7, fig. D.

Distrib. Lagos, Cameroons.

5. **U. Elliotianum.**—*Uvaria Elliotiana*, Engl. & Diels in Engl. Monogr. Afr. Pfl. vol. vi. p. 28 (1901).

Distrib. Sierra Leone, Northern Nigeria, Lagos.

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* The differences in the stigmas of *Meiocarpidium* and *Uvariastrum* mentioned in the key are not visible in the plate.

† Engl. Jahrb. vol. xxxix. p. 473.

Xylopia, *Linn.* Syst. ed. 10, p. 1250 (1759). *Unona,* Linn. f. Suppl. p. 270 (1781).

The type-specimen of *Unona discreta,* Linn. f. (1781) in the Linnean Herbarium is conspecific with *Xylopia salicifolia,* Humb. et Bonpl. (1817), and that species should therefore bear the name *Xylopia discreta.* Its synonymy and distribution are as follows:—

X. discreta.—*Unona discreta,* Linn. f. Suppl. p. 270 (1781). *X. salicifolia,* Humb. et Bonpl. ex Dunal, Monogr. Anonac. p. 121, t. 17 (1817); H.B.K. Nov. Gen. Sp. Pl. vol. v. p. 63; Mart. Fl. Bras. vol. xiii. pars 1, p. 42, in obs.; Benth. in Hook. Lond. Journ. Bot. 1843, vol. ii. p. 359; Pulle, Enum. Vasc. Pl. Surinam, p. 177.

Distrib. Colombia, Venezuela, Guiana.

X. Lane-Poolei, sp. nov.; affinis *X. Elliotii,* Engl. & Diels, foliis conspicue acuminatis ad basin attenuatis infra glabris, pedicellis longioribus nutantibus, bracteis minoribus deciduis, petalis brevioribus obtusioribus differt.

Arbor erecta, alta; truncus rarius ultra 45 cm. diametro, cortice atrobrunneo obtectus; ramuli hornotini flexuosi, glabri vel minutissime puberuli, subglauci, internodiis brevibus 0·5–1·3 cm. longis. *Folia* oblanceolata vel obovato-oblanceolata, breviter et obtuse acuminata, acumine 3–5 mm. longo, ad basin sensim attenuata, 4–7·5 cm. longa, 1·5–3 cm. lata, subcoriacea, juniora parce puberula, mox utrinque glabra; costa media supra leviter impressa, infra prominens, subcarinata, basi circiter 1·25 mm. lata, ad laminae apicem angustissima, sicco minute verrucosa; nervi laterales circiter 7, graciles, utrinque prominuli, inferiores ascendentes, ceteri a costa sub angulo 45° abeuntes, arcuati, circiter 6–7 mm. intra marginem conjuncti, ultra juncturas intricate anastomosantes; venae supra obsoletae, infra sublaxe prominentes; petioli 4–5 mm. longi, 1·5 mm. crassi, minutissime puberuli et glaucescentes. *Flores* axillares, solitarii vel usque ad 3-nati, pedicellati, primum nutantes, demum ut videtur patuli; pedicelli 5–6 mm. longi, inferne circiter 0·65 mm. crassi, superne leviter ampliati, puberuli, cicatricibus bractearum mox deciduarum notati. *Sepala* late ovata, apice leviter mucronata, 2–2·5 mm. longa, 3–3·5 mm. lata, coriacea, extra tomentella, intra glabra. *Petala* exteriora late linearia, apice rotundata, ad basin leviter expansa, 1·5 cm. longa, ad 4 mm. lata, coriacea, dense et breviter adpresse pubescentia, intra basin subglabra; petala interiora exterioribus paullo breviora et angustiora, intra basin concavam 4 mm. longam glabra, ceterum breviter pubescentia. *Stamina* carpellis breviora; antherae conspicue locellatae, 1 mm. longae, connectivo oblique truncato lato sublobulato; filamenta brevia, lata. *Carpella* pauca, erecta; ovarium circiter 1·5 mm. longum, latere exteriore dense villosum, stigmate ellipsoideo subacuto 1 mm. longo apice minute hirsuto coronatum. *Fructus* non visus.

Distrib. Sierra Leone: Headquarters Distr.; Heddles Farm, Apr., *Lane Poole* 210. Freetown, March, *Dalziel* 956.

Vernacular—*Kpaini* (Lane Poole).

Xylopia Lane-Poolei, Sprague et Hutchinson.

A, flowering branchlet, nat. size; B, calyx and and pistils, × 4; C and D, outer and inner petals, × 3; E, stamen, × 5; F, pistil, × 10.

This species shows a very marked affinity with *X. Elliotii*, Engl. & Diels, which was collected by Scott Elliot in the Niger Basin to the north-east of Sierra Leone. In addition to the differential characters shown above, it may be noted that the slender and rather elongated branchlets of *X. Elliotii* are fairly densely clothed with long spreading rufescent hairs, and the leaves are very abruptly and shortly cuneate at the base and not or only slightly acuminate at the apex; the flowers of Scott Elliot's plant are white and sweet-scented, and, especially when in bud, they are much longer and not so stout as in *X. Lane-Poolei*.

XXVIII.—SIR ARTHUR CHURCH'S COLLECTION OF BOTANICAL DRAWINGS.

The water-colour drawings of plants by various botanical artists in the collection of the late Sir Arthur Church have recently been presented by Lady Church to the Royal Botanic Gardens, Kew. This interesting and valuable collection, which includes examples of the work of the more important early flower painters from the time of Simon Varelst, has been arranged at the expense of Lady Church on the walls of the small room, once Miss North's studio, adjoining her gallery, and is now open to public inspection.

Of the sixty-seven drawings presented by Lady Church, forty-six are to be seen on the walls, and the remaining twenty-one have been placed with the collection of drawings in the Herbarium.

In order to make as representative a display of the work of botanical artists as possible, twenty drawings, principally by more recent artists, have been selected from the collection preserved in the Herbarium and placed on the walls of the room with those presented by Lady Church.

Sir Arthur Church was so keenly interested in the welfare of the Royal Botanic Gardens and was always so ready to assist the Institution from his fund of special and peculiar knowledge that no more fitting memorial to him could have been devised than the presentation of his collection of drawings to Kew. In order that his memory may be preserved, the collection of drawings for the time being displayed in this room will bear his name.

In the following list the names of the artists are arranged in alphabetical order and the subjects of their pictures are given. In a few cases it will be noticed that two or three plants are included in one picture. Some particulars of the various artists have been compiled by Miss M. Smith, and these follow the alphabetical catalogue.

The drawings belonging to the Kew collection are marked (K).

Many of the drawings are on vellum.

Allport, Mrs. J. (2 Drawings.)	...	Ixia paniculata (K). Lilium longiflorum (K).
Bauer, F. ...	...	Erica coccinea (K).
Bond, G. ...	...	Tritonia crispa.
Brown, P. ... (4 Drawings.)	...	Amaryllis belladonna. Cotyledon orbiculata. Helleborus lividus. Yucca gloriosa.
Cambresier, J.	...	Tillandsia paniculata (K).
Chazal, A. ...	...	Crocus Boryi (K).
Cotton, Miss B.	...	Cattleya Loddigesii.
Curtis, J. ... (2 Drawings.)	...	Campanula sarmatica (K). Hiptage Madablota.
Duncanson, T.	...	Crotalaria quinquefolia.
Edwards, J. ...	...	Hollyhocks.

Edwards, S. T. (5 Drawings.)	...	Argemone mexicana and Rhododendron (Azalea) nudiflorum. Iris germanica, I. versicolor and I. variegata. Rhododendron caucasicum. Rhododendron ponticum and Robinia hispida. Tecoma radicans and Butomus umbellatus.
Ehret, G. D. ... (8 Drawings.)	...	Basella rubra. Cassia Marylandica. Daboecia polifolia. Iris variegata. Stuartia Malacodendron. Tulips (2 drawings). Veratrum album.
Fitch, W. H. (4 Drawings.)	...	Gentiana concinna (K). Rhododendron arboreum, var. (K). Rhododendron Dalhousiae (K). Rosa amabilis (K).
Fother, V. ...	...	Nerine sarniense.
Hooker, Sir J. D.	...	Rhododendron Thomsoni (K).
Hooker, Sir W. J. (2 Drawings.)	...	Oncidium barbatum. Rhododendron albiflorum (K).
Hooker, W. ...	...	Phlox maculata (K).
Huysum, J. van	...	Orange Blossom, Tulip and Rudbeckia.
Moggridge, J. T. (3 Drawings.)	...	Gentiana ciliata (K). Iris Chamaeiris (K). Ophrys arachnites, O. Scolopax, and O. apifera (K).
Nodder, R. P. (4 Drawings.)	...	Canarina campanulata. Erica australis. Erica cinerea. Mesembryanthemum aureum.
Power, A. ... (5 Drawings.	...	Aucuba japonica. Mirabilis longiflorum and M. jalapa. Podalyria calyptrata. Tecoma radicans. Yucca filamentosa.
Prêtre, T. G. ...	..	Crocus susiana.
Redouté, P. J.	...	Sedum Telephium.
Sowerby, J. ... (2 Drawings.)	...	Isotoma longiflora. Lachenalia tricolor.
Stothard, T. ... (2 Drawings.)	...	Campanula glomerata. Geranium pratense.
Varelst, S. ... (2 Drawings.)	...	Gentiana acaulis. Tulips.
Walton, Miss S.	...	Buddleia globosa.

Westcombe, Miss	...	Stapelia hamata (K).
Unknown Artists (6 Drawings.)	...	Argyreia Wallichii. Aster puniceus. Callistemon lanceolatum. Gourds. Punica Granatum. Rudbeckia triloba (Ehret ?).

Allport, Mrs. Julia.—She made many drawings of plants "in their native countries" between 1814 and 1844. These were presented to the Royal Botanic Gardens by Mr. J. M. Ludlow, C.B., in 1904.

Bauer, Franz.—Bauer was born at Felsberg, in Austria, on October 4th, 1758, and accompanied his friend Baron J. Jacquin to England in 1788. He became Botanical Painter to George III., and Resident Artist to the Royal Gardens, Kew, a post he held for 50 years. In 1791–1800 he published "Delineations of Exotic Plants," under the patronage of Sir Joseph Banks, in 1818 "Stretlitzia Depicta," and in 1830–38 "Illustrations of Orchidaceous Plants." He died on December 11th, 1840, aged 82, and a monument was erected to his memory in Kew Church.

Bolton, James (flourished 1775–95).—He was born in Halifax and contributed the Plates to Watson's "History of Halifax," 1775. He was author of "Filices Britannicae," 1785–90, and a "History of Funguses about Halifax," 1788–91. He also drew the plates for Relhan's "Flora Cantabrigiensis."

The drawing by him in Sir Arthur Church's collection has been placed in the Herbarium.

Bond, George.—A young gardener at Kew, who succeeded Thomas Duncanson in 1826 as Botanical Artist to Kew. In 1835 he became gardener to the Earl of Powis at Walton. His drawings of about 1700 plants are in the collection in the Herbarium.

Brown, Peter.—He was appointed Botanical Painter to the Prince of Wales. He exhibited at the Royal Academy between the years 1770–1791.

Cambresier, Jean.—Cambresier was one of many artists employed by M. Edouard Morren, of Liége, to draw his wonderful collection of Bromeliads; some of them are of great size, $2\frac{1}{2}$ feet by $3\frac{1}{4}$ feet. They were purchased by the Bentham Trustees in 1887 and presented by them to the Royal Gardens, Kew. He also contributed several plates to Morren's "La Belgique Horticole" between the years 1882–1885, when M. Morren died and the publication ceased to exist.

Chazal, A.—Executed several drawings on vellum of species of *Crocus* for J. Gay, which are now in the Library of the Royal Botanic Gardens. The drawings bear the dates 1831–1835.

Cotton, Miss Barbara.—She contributed 3 plates to the Transactions of the Horticultural Society, v. t. 12, 15, 18 in 1824, and also exhibited at the Royal Academy from 1815–1822, when her address seems to have been Chicheley, Newport Pagnell.

Curtis, John.—Curtis was born in Norwich in the year 1791, and in early life did much work, both drawing and engraving, for the Horticultural and Linnean Societies. After the defection of Sydenham Edwards he worked for the "Botanical Magazine" for some seven volumes. He was chiefly celebrated for his "Illustrations of British Entomology," 770 plates, and for many years he made a special study of insects injurious to farm and garden produce for the "Gardeners' Chronicle," under the pseudonym "Ruricola." He was elected a Fellow of the Linnean Society in 1820, and died in Islington in 1862.

Duncanson, Thomas.—He was a young gardener from the Royal Botanic Gardens, Edinburgh, and was employed by W. T. Aiton in 1822 to draw the plants in the Royal Gardens, Kew. He continued to do this until the summer of 1826, when he unfortunately became insane. He made upwards of 300 drawings which are in the Kew collection.

Edwards, John, Fellow of the Society of Arts (flourished 1768–95.—He supplied the text and plates of the "British Herbal," 1775, and of his "Collection of Flowers," 1795.

Edwards, Sydenham.—Born at Abergavenny in 1769. Edwards was educated as an artist by the kindness of William Curtis, the founder of the "Botanical Magazine." He was a regular contributor to the Magazine from 1799–1814 when he severed his connection with it, and started the "Botanical Register," with the assistance of J. Bellenden Ker. He brought out the "New Botanic Garden," 1805–7, and was elected a Fellow of the Linnean Society in 1804. The Genus *Edwardsia* was named after him. He died and was buried at Chelsea in February, 1819 (1822?).

Ehret, Georg Dionysius.—G. D. Ehret was born in Erfurt, Saxony, 1708 (1710?). His father being gardener to the Prince of Baden Durlach, while still very young G. D. Ehret painted the flowers in the Prince's gardens, and from these, numbering 500, Trew selected the ones for the "Plantae Selectae." He travelled in Switzerland and France, and when working at the illustrations for the "Hortus Cliffortianus" met Linnaeus and was instructed by him in drawing the structure of flowers. He came to England in 1740, and remained there till his death in September, 1770. Trew named the genus *Ehretia* after him. Among his patrons were the Duchess of Portland, for whom he drew 800 plants, Sir H. Sloane, 300 plants, Dr. Fothergill, 200 plants, and R. Willett, of Merly, Dorset. He drew the figures for Brown's "Natural History of Jamaica," but these are not in his best style. His skill and accuracy are almost unexampled, and the drawing of *Stuartia*, in Sir Arthur Church's collection is one of the finest examples of his work. He was elected a Fellow of the Royal Society in 1857.

Fitch, Walter Hood, was born in Glasgow on February 28th, 1817, and was early set to work drawing patterns for calico printers. Sir William Hooker had him trained as a Botanical Artist, and he soon showed the absolute accuracy, artistic charm, and great rapidity of execution which have made him a prince of botanical artists. An account of his work was published in the *Bulletin* for 1915, p. 277. He published a series of lessons on Botanical Drawing in the "Gardeners' Chronicle" in 1869, probably his only literary effort. The genus *Fitchia* was named after him. He was elected a Fellow of the Linnean Society in 1857 and died at Kew on January 14th, 1892.

Fother, V.—A drawing by him of *Capraria undulata* is in the Natural History Museum, South Kensington, but we have been unable to discover any authentic information about his career.

Hooker, Sir Joseph Dalton.—Sir Joseph was born on June 30th, 1817, at Halesworth, in Suffolk, and from the age of four was brought up at Glasgow in an atmosphere of Botany and Horticulture. An account of his life and activities is given in the *Bulletin* for 1912, pp. 1, 439, and we need only add here an appreciation of his facile skill and feeling as an artist. Fitch's illustrations of the Himalayan Rhododendrons were prepared from Sir Joseph's sketches, and no one who sees them can doubt that, had he been able to devote time to the art, he would have attained the highest eminence as a botanical artist. He died on December 10th, 1911, at Sunningdale, Berks, and is buried at Kew.

Hooker, Sir William Jackson, was born in Norwich on July 6th, 1785. He was Regius Professor in Glasgow University in 1820, and in 1841 became the first Director of Kew. He accomplished an immense amount of work himself, and it has been estimated that his numerous works have been illustrated by upwards of 8000 plates, of which he himself contributed 1800. For some 10 years he was the artist of the "Botanical Magazine," as well as Editor, and he himself illustrated his "Exotic Botany," his "Flora Boreali Americana," "The Botany of Beechey's Voyage," and some of his various "Journals of Botany." He died on August 12th, 1865, at Kew, and is buried there.

Hooker, William, was born in 1779, and was a pupil of Franz Bauer. He engraved and coloured Knight's "Pomona Herefordiensis" and Lambert's "Pinetum," and himself produced "Pomona Londinensis," 1813–1818. He was the artist to the "Paradisus Londinensis," to which R. A. Salisbury contributed the descriptions, and was engaged by the Royal Horticultural Society to draw the plates for their Transactions. He lived at Kew, and died there early in 1832.

Huysum, Justus van, lived at Amsterdam, where his celebrated son Jan was born in 1682. He himself was an artist of some reputation, and his technical skill is well shown by the drawing exhibited.

Moggridge, John Traherne, was born in 1842. Owing to bad health he wintered for many years at Mentone, and having inherited botanical tastes from his father and grandfather (L. W. Dillwyn), he brought out the "Contributions to the Flora of Mentone," for which he drew all the plates with great faithfulness and delicate charm; the text, also contributed by himself, contains interesting details of the plants. He was also the author of "Harvesting Ants and Trapdoor Spiders," beautifully illustrated by himself. He died in 1874.

Nodder, R. P.—An English painter of horses and other animals exhibited at the Royal Academy from 1786–1820. He was appointed botanical painter to George III., and after that exhibited a few flower pictures. No particulars of his life have been found.

Power, A.—He came from Maidstone and exhibited a flower piece and three studies from nature at the Royal Academy in 1800. There are two watercolours of his, of buildings and landscapes, in the British Museum.

Prêtre, T. G.—A number of beautiful drawings on vellum of the genus *Crocus* were executed by him for J. Gay between the years 1823–1830. They are now in the Library of the Royal Botanic Gardens, Kew.

Redouté, Pierre Joseph, was born in 1759 at S. Hubert, Pays de Liége, and died in Paris in 1840. He was early commissioned to draw plants for the King's Cabinet, and was appointed in 1792 Artist to the Académie des Sciences. He published his "Liliaceae" in 8 volumes in 1802, the text being by De Candolle and others, and he illustrated many other works: "Les Roses," the descriptions being by C. A. Thory; Desfontaine's "Flora Atlandica," "Choix des plus belles Fleurs," De Candolle's "Histoire des Plantes Grasses," etc. He has been called the Raphael of Flowers. The drawing bearing his name is somewhat doubtfully attributed to him.

Sowerby, James, was born in London on March 21st, 1757, and died at Lambeth on October 25th, 1822. In early life he was a teacher of drawing and portrait painting, and contributed most of the plates to the first volume of the "Botanical Magazine." He published his "Botanical Drawing Book" in 1789, and from 1789–97 appeared his "Flora Luxurians" or "Florists' Delight," a folio with coloured plates. With Sir James Smith he brought out "English Botany" in 36 volumes with 2592 plates between 1790–1814, also "British Fungi," 1797–1809, and "Exotic Botany," 1804–05. The genus *Sowerbaea* was called after him. He was elected an Associate of the Linnean Society in 1788 and a Fellow in 1793, and was also a Fellow of the Geological Society having great skill in drawing minerals.

Stothard, Thomas, was born in London in 1755. He was apprenticed, at an early age, to a calico printer, but soon went on to a higher branch of art, and studied at the Royal Academy. While there he illustrated "Town and Country Magazine." Bell's "British Poets," and the "Novelists' Magazine." He was elected an Associate in 1785, and a Royal Academician in 1794.

His works are said to have exceeded 5000 in number. Besides illustrating books he designed the frescoes on the staircase at Burleigh (Marquis of Exeter) and the ceiling of the Advocates' Library, Edinburgh.

Varelst (or Verelst) Simon, was born at Antwerp in 1604. He was an admirable painter of fruit and flowers. He came to England in the reign of Charles II., and obtained considerable reputation, not only for his flower painting, for which he was well qualified, but also for his attempts at portrait painting, for which he had no talent. He seems to have been much ridiculed for his efforts. He died in 1651.

Walton, Sarah, was a flower painter who exhibited in 1812. A drawing of *Cephalanthera grandiflora* by her may be seen at the Natural History Museum, South Kensington.

Westcombe, Miss.—She was one of three sisters living with their brother, Thomas Westcombe, at Worcester. She executed some charming and faithful drawings of Stapelias (and allied genera) which, together with numerous notes and the plants themselves, were presented to Kew on the death of Mr. Westcombe in 1893 at the age of 78. The family belonged to the Society of Friends.

XXIX.—MISCELLANEOUS NOTE.

Rosha Grass (*Cymbopogon Martinii*, Stapf).*—An interesting and comprehensive paper by R. S. Pearson (Forest Economist, Dehra Dun) on the distribution, present methods of distillation and outturn of this grass and the uses and market value of the oil prepared from it is to be found in the Indian Forest Records, vol. v, part vii (April, 1916). A map showing the distribution of the principal areas of Rosha grass in Central India is interesting as it differentiates between the two varieties known as "Motia" and "Sofia." New observations concerning the ecological conditions under which these varieties occur are given and there is no doubt that they yield chemically distinct oils; but the morphological differentiation is still obscure. Experiments, however, are now carried on at Dehra Dun to see how far the chemical characters can be connected with morphological features recognisable in the field and in dried material. Rosha oil (both Motia and Sofia) is used all over India for the manufacture of native "attars" or the adulteration of "attar" of roses, and to some extent also for medical purposes. The output of Rosha oil from the 1st of July, 1912, to the end of June, 1913, is estimated at 150,000 lbs. valued at 750,000 Rs., which was more than half as much again as in the preceding years, when India and Arabia each took on the average 20,000 lbs., and Europe 60,000 lbs. The mode of production is still rather crude and not as profitable as it might be if steam-distillation were introduced which would save fuel, improve the quality and raise the quantity of oil very considerably.

A "Note on the Constants of Indian Geranium Oil (Motia)," by Puran Singh, Chemical Adviser, Dehra Dun, is added to Mr. Pearson's Paper.

O. S.

* See *Kew Bulletin*, 1906, pp. 335–341.

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OF

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No. 7.] [1916.

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Continued on p. 3 of cover.]

FIG. 1.

FIG. 2.

FIQUE.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

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XXX.—FIQUE.

FURCRAEA GIGANTEA.

(*With Plate.*)

We have recently received from MR. M. T. DAWE, Director of Agriculture, Colombia, some interesting samples of Fique fibre and articles made therefrom which have been placed in Museum No. II.

In addition Mr. Dawe sent some photographs, two of which are here reproduced, one showing the method of drying the fibre and the other of the green leaves being used as thatch for a house. A sample of the fibre, which is usually known as Mauritius Hemp, has been sent to a firm of Brokers in London and was valued on April 19th at £40 per ton.

The accompanying note was sent to Kew by Mr. Dawe with the specimens and photographs.

"There are probably few vegetable products, the subject of domestic industry, particularly in the fibre world, which have so wide an application in everyday use as Fique in Colombia.

"Fiqué is the fibre of *Furcraea gigantea*, and is grown everywhere in the sub-tropical parts of Colombia, but especially in the districts of limestone formation, where the spiny form is found in a wild condition growing abundantly on the hills.

"In travelling through Colombia one notices everywhere the great variety of application to which this fibre is put. The Alpargatas or shoes worn by the masses in this part of South America are soled with Fique, and it is evident that the consumption of fibre for this purpose alone must be enormous. Sacks or Costales for the collection of coffee on the plantations are made of Fique. Sacks for the local transport of charcoal, maize and produce generally are of Fique. The pack-saddles and girths for transport mules and bullocks, ropes and cords are likewise of Fique. Matting resembling cocoanut fibre is also manufactured locally from dyed Fique, and is becoming an increasingly important industry consuming large quantities of the fibre. In the towns marketing is generally done with Mochilas or little bags made of coloured Fique; even the banks use little bags of the same fibre for the convenience of their customers for the conveyance of cash, in substitution for paper or linen bags generally used in other countries. Perhaps, how-

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ever, one of the most novel uses of Fique to be seen in Colombia is the employment of the green leaves for thatching purposes as shown in the accompanying photograph (see Plate VII., fig. 1). A specimen of the plant which forms the source of this fibre will be noted in the picture on the left.

"The annual consumption of fibre for the industrial purposes above-mentioned must be very considerable, but notwithstanding this, the cultivation and preparation of the fibre is principally a domestic industry. There are a few persons who are now giving attention to the preparation of fibre articles and material by machinery, but up to the present only in a small way.

"In the temperate parts the peasantry generally possess a few plants of Fique, sometimes planted to form a fence to their garden or homestead, in other cases a patch of land useless for other purposes. The fibre they extract by pulling strips of the leaves through a knife arrangement fixed on a tree. One man generally shreds the leaves while another extracts the fibre. By this method two men prepare on the average about ten pounds of dry fibre in a day, which costs in value of labour alone 7 centavos or 3½d. per lb. The fibre is sold in the Bogotá market for 10 to 12 centavos (5d. to 6d.) per lb., a much higher price than the fibre realises in the markets of the United States or Europe. In one municipality of some 7250 inhabitants, the approximate amount of fibre prepared annually by this laborious and unremunerative method is said to be about 100,000 lbs. This means to say, on the basis of 5 lbs. of dry fibre being the output of one man in a day, that this production represents 20,000 days of labour; which, valued at the local rate of 35 centavos per day, is equal to a money value of $7000 gold.

"These figures if only approximately correct serve to indicate the local possibilities which lie in the organisation and development of this industry on modern lines, by the employment of suitable machinery. There are few countries where Fique grows so well and lives so long as in Colombia; and the better organisation of the industry locally, which would doubtless result in sound and profitable commercial developments, would, at the same time, release a considerable supply of labour that may be much more profitably utilised."

The following additional information has been extracted from an article in Spanish by Mr. Dawe, published in *El Diario Nacional*, Bogotá, for the 8th of March, 1916:—

"Using modern machinery, the cost of production of the fibre and freight to Bogotá or other centre in Colombia would amount to $65 per ton, yielding a profit of $95 (£19) per ton, if sold at the present local wholesale price of $160 per ton. The profits on export would be considerably lower, but any surplus after meeting the home demand could be exported to New York at a total cost, including production, of about $95 per ton. This would yield a profit of about £5 to £10 per ton, taking the selling price at £25–£30 per ton."

EXPLANATION OF PLATE VII.

Fig. 1. A house thatched with the green leaves of *Furcraea gigantea*.
Fig. 2. The fibre hung out to dry.

XXXI.—NOTES ON AFRICAN COMPOSITAE: II.

J. Hutchinson.

Brachymeris, *DC.*, and Marasmodes, *DC.*

The genus *Brachymeris*, DC.,* was reduced to *Marasmodes*, DC.,† by Bentham in the Genera Plantarum, and this treatment was followed by Hoffmann in Engler's Natürliche Pflanzenfamilien; but the two genera seem sufficiently distinct to be kept apart. The difference lies chiefly in the pappus. In *Marasmodes* it consists of about eight well-developed, hyaline, flat, membranous scales about half as long as the corolla-tube; in *Brachymeris* there is no pappus or at most a mere undulation of the top of the achene between the ribs or angles. As the structure of the pappus in *Compositæ* is perhaps one of the most important features in the consideration of the phylogeny and affinities of the genera of this interesting family, there seems some justification for following DeCandolle's views in the case of the two genera mentioned. Moreover, there is another difference, which, though not usually of generic value, is sufficiently important as an associated character; the leaves of *Marasmodes* are densely glandular-pitted, a feature not shared by *Brachymeris*. The differential characters of *Marasmodes*, *Brachymeris*, and *Stilpnophytum*, Less., a closely allied genus, are shown in the following:—

Marasmodes, DC.—Capitula solitaria vel pauca; achaenia omnia fertilia; pappi squamae bene evolutae, circiter 8. planae, membranaceae; folia glanduloso-punctata.

Brachymeris, *DC.*—Capitula solitaria vel pauca; achaenia omnia fertilia; pappus nullus; folia epunctata.

Stilpnophytum, *Less.*—Capitula plerumque umbellato-corymbosa; achaenia interiora tenua, vacua, exteriora crassiora, fertilia; pappus nullus; folia epunctata.

Marasmodes, *DC.—Clavis specierum.*

Folia patentia; capitula multiflora, solitaria vel pauca:—
  Folia remota:—
    Folia circiter 1·5 cm. longa, apice callo obtuso mucronata; capitula sessilia ... ... 1. *M. polycephalus.*
    Folia usque ad 0·8 cm. longa, apice mucrone obliquo acuto instructa... 2. *M. oligocephalus.*
  Folia fasciculata, circiter 0·5 cm. longa ... ... 3. *M. Adenosolen.*
Folia ad ramulos adpressa, 0·3–0·5 cm. longa; capitula 4–5–flora, subglomerata ... ... 4. *M. Dummeri.*

---

* DC. Prodr. vi. 76 (1837).
† DC. l.c. 136.

1. **M. polycephalus,** *DC.* Prodr. vi. 136 (1837); Harv. in Harv. et Sond. Fl. Cap. iii. 175. *Oligodorella teretifolia,* Turcz. in Bull. Soc. Nat. Mosc. xxiv. i. 187 (1851).

South Africa.—South-Western Region: Stellenbosch, *Zeyher* 808 (Harv. l.c. quotes *Ecklon*). "Cape," *Ecklon* 1333 (not seen).

2. **M. oligocephalus,** *DC.* Prodr. vi. 136 (1837). *M. polycephalus,* var. *oligocephalus,* Harv. in Harv. et Sond. Fl. Cap. iii. 175.

South Africa.—South-Western Region: Malmesbury; Groenekloof, *Ecklon* (fide Sonder l.c.); Leliefontein, near Hopefield, Mar., *Bachmann in Herb. Bolus* 5969.

I have not seen the type of this species which is in Herb. Sonder, but I have little doubt from description and the distribution that the Bolus specimen is the same.

3. **M. Adenosolen,** *Harv.* in Harv. et Sond., Fl. Cap. iii. 175 (1865).

South Africa.—South Western Region: Piquetberg; 100 m. alt., June, *Schlechter,* 7899; "Cape," *Ecklon and Zeyher* (Herb. Sonder).

The type of this has not been seen, but as Schlechter's specimen was distributed under the above name, there seems no reason on comparing the description to doubt the determination.

4. **M. Dummeri,** *Bolus* mss., ex *Hutchinson.*

Suffrutex 1·5–3 dm. altus; rami graciles, subteretes, glabri, internodiis circiter 0·5 cm. longis; ramuli recti, elongati, usque ad 7 cm. longi, glabri. *Folia* ad ramulos arcte adpressa, ericoidea, obtusa, basi minute et obtusissime hastata, 3–5 mm. longa, basi 1–1·5 mm. lata, crassa, supra canaliculato-concava, infra convexa, glandulis immersis nigrescentibus punctata. *Capitula* ramulorum apices versus glomerata, subsessilia, 4–5-flora, 4·5 mm. longa. *Involucri* bracteae paucae, 3–4 seriatae, ab extremo abrupte longiores, interiores lineari-oblanceolatae, obtusae, usque ad 4 mm. longae, tenuiter paleaceae, glabrae. *Corollae* tubus 1·75 mm. longus, inferne cylindricus, superne campanulato-ampliatus, extra glandulosus; lobi 5, oblongo-lanceolati, obtusi, 1 mm. longi, glabri. *Antherae* exsertae, 1 mm. longae. *Styli* rami breves, exserti, truncati, 0·5 mm. longi. *Achaenia* 1·5 mm. longa, glandulis immersis instructa. *Pappi* squamae 0·3 mm. longae, hyalinae, oblongae, obtusae.

South Africa.—South-Western Region: Cap. div.; grassy plains around Kraaifontein, June, *Dümmer* 1549.

Brachymeris, *DC.—Clavis specierum.*

Rami apice spinescentes; folia internodiis aequilonga vel breviora; capitula subsessilia	1. *B. scoparia.*
Rami apice haud spinescentes:—	
Folia glabra vel fere glabra:—	
Rami erubescentes, parce foliati, foliis internodiis aequilongis vel brevioribus; capitula solitaria vel 3-nata, graciliter et longe pedunculata	2. *B. erubescens.*

Rami haud erubescentes, dense foliati, foliis internodiis multo longioribus; capitula plerumque numerosa, dense glomerato-corymbosa :—
Folia 2 mm. lata; capitula circiter 1 cm. diametro ... ... 3. *B. athanasioides.*
Folia 1 mm. lata; capitula circiter 0·5 cm. diametro :—
Involucri bracteae interiores apice lanato-pubescentes ... 4. *B. montana.*
Involucri bracteae interiores glabrae ... ... 5. *B. Bolusii.*
Folia et involucri bracteae dense sericeae; capitula solitaria... ... ... 6. *B. Peglerae.*

1. **B. scoparia,** *DC.* Prodr. vi. 76 (1837); Drège, Zwei Pflanzengeogr. Docum. 55; Harv. in Harv. et Sond. Fl. Cap. iii. 163.
Brachystylis scoparia, E. Mey. ex DC. l.c., nomen.

South Africa.—Karroo Region: Graaff Reinet; Sneeuw Berg Range, 1300–1640 m., Sept., *Drège* c. Upper Region: Richmond; Winterweld near Limoenfontein and Groot Tafelberg, 1000–1300 m., Dec.-Jan., *Drège, A;* Klein Tafelberg, *Burke & Zeyher,* 147.

I have not seen Drège's *b* specimen from the Zeekoe River, Richmond Division (Drège l.c. 54).

2. **B. erubescens,** *Hutchinson,* sp. nov.

Caules pauci, e rhizomate lignoso orti, circiter 3 dm. alti, erubescentes, apicem versus ramosi, crasse costati, glabri, basi subdense superne remotissime foliati. *Folia* inferiora subulato-linearia, acutissima, 1·5–1·7 cm. longa, rigide coriacea, glabra; folia superiora inferioribus multo breviora. *Capitula* solitaria, laxe corymbosa, circiter 0·6 cm. longa, ∞-flora; pedunculi (vel ramuli) usque ad 10 cm. longi, graciles, glabri. *Involucrum* campanulatum, 0·4 cm. longum; bracteae 3-seriatae, exteriores minimae, lanceolatae, subacutae, 1·5–2 cm. longae, glabrae, intermediae oblongo-lanceolatae, 3 mm. longae, submembranaceae, dorso erubescentes, margine minute laceratae, interiores subspatulato-oblanceolatae, apice rotundatae, 0·5 cm. longae, glabrae. *Corollae* tubus 2·25 mm. longus, inferne cylindricus, superne anguste campanulato-ampliatus, extra parce glanduloso-pubescens; lobi 5, lanceolato-triangulares, subobtusi, 0·75 mm. longi. *Antherae* semiexsertae, 1·75 mm. longae. *Styli* rami curvati, truncati, 0·75 mm. longi. *Achaenia* apice calva, 10–costata, glabra, 1·75 mm. longa.

South Africa.—Upper Region: Cradock: near Mortimer, 840 m. alt., Jan., *L. Kensit in Herb. Bolus* 9292.

Eastern Region: Tembuland, Tabase, near Bazeia, 800 m. alt., Nov., *Baur* 334.

3. **B. athanasioides,** *Hutchinson,* comb. nov.

Pentzia athanasioides, S. Moore in Journ. Bot. 1903, 133.

South Africa.—Kalahari Region: Transvaal; Jeppe's Town Ridge, Johannesburg, 18–20 m., Sept., *Gilfillan in Herb. Galpin*

6026; amongst rocks in Orange Grove near Johannesburg, Oct., *Conrath* 405; rocky places near Hospital Hill, Johannesburg, *Rand* 758 (type).

4. **B. montana,** *Hutchinson*, sp. nov.

Frutex ramosus; rami foliorum basibus persistentibus rugosi, teretes, fere glabri; ramuli hornotini interdum fasciculati, dense foliati, breviter et tenuiter lanati. *Folia* linearia, acuta, 2–3 cm. longa, 1 mm. lata, plana, conspicue 1-nervia, chartacea, glabra. *Capitula* dense glomerato-corymbosa, breviter pedunculata, globoso-campanulata, circiter 0·5 cm. diametro; pedunculi 0·5–1 cm. longi, parce bracteati, lanati. *Involucrum* 0·5 cm. longum; bracteae circiter 4-seriatae, ab extremo sensim longiores, exteriores subulato-lanceolatae, acutae, glabrae, intermediae lanceolatae, acute acuminatae, interiores lineares, acutissimae, hyalinae, circiter 4 mm. longae, apice pubescentes. *Corollae* tubus 2·25 mm. longus, inferne cylindricus extra glandulosus, superne sensim ampliatus; lobi 5, oblongo-lanceolati, obtusi, 0·25 mm. longi. *Antherae* 1·25 mm. longae. *Styli* rami vix exserti, fere 1 mm. longi. *Achaenia* costata, cylindrica, 1 mm. longa, glabra, apice annulo minutissimo coronata.

South Africa.—Kalahari Region: Mt. Marovougne, Apr., *Junod* 1278 (type); Macalisberg, May, *Burke* 497. "Cape," *Zeyher* 1040.

5. **B. Bolusii,** *Hutchinson*, sp. nov.

Frutex parvus, superne ramosus; rami foliorum basibus persistentibus rugulosi, teretes, inferne glabri; ramuli hornotini conferti, dense foliati, parce lanato-pubescentes. *Folia* linearia, acuta, 1–1·5 cm. longa, 0.5–1 mm. lata, plana, sicco rugulosa, chartacea, glabra. *Capitula* homogama, subsolitaria, breviter pedunculata, campanulata, circiter 0·5–0·7 mm. diametro; pedunculi circiter 1 cm. longi, lanati, bracteis lineari-subulatis acutis 2·5 mm. longis fere glabris instructi. *Involucrum* 0·5 cm. longum; bracteae 4–5-seriatae, ab extremo sensim longiores, subulato-lanceolatae vel lineares, acutae, usque ad 5 mm. longae, margine minute serrulatae, glabrae. *Flores* ut in *B. montana*, sed achaeniis inter costas minutissime glandulosis.

South Africa.—Eastern Region: Drakensberg; Devil's Kantoor Mt., about 1730 m., Sept., *Bolus* 7786.

6. **B. Peglerae,** *Hutchinson*, sp. nov.

Caules ascendentes, subsimplices vel superne parce ramosi, costati, dense albo-sericei. *Folia* imbricata, ascendentia, linearia, acuta, 1·3–1·5 cm. longa, 1–1·25 mm. lata, dense cinereo-sericea. *Capitula* solitaria, breviter pedunculata, subturbinato-campanulata, 1 cm. longa. *Involucri* bracteae dense sericeae, circiter 3-seriatae, exteriores paucae, lineari-lanceolatae, acutae, interiores lineares, subhyalinae, obtusae, 5 mm. longae. *Corollae* tubus 2·5 mm. longus, inferne cylindricus, parce glanduloso-puberulus, superne subito ampliatus; lobi 5, triangulari-lanceolati, subobtusi. *Antherae* semiexsertae, 1.25 mm. longae. *Styli* rami

crassi, 0·5 mm. longi. *Achaenia* subcylindrica, circiter 8-costata, 2·5 mm. longa, glabra, apice annulo minute crenulato coronata.

South Africa.—Eastern Region: Tembuland; Umtata River banks, 800 m., Jan., white stemmed, flowers yellow, *Pegler* 1601.

This is a very striking species, easily recognised by the dense, silky covering of hairs.

Stilpnophytum, *Less.—Clavis specierum.*

Folia conferto-imbricata, anguste linearia, plerumque internodiis multo longiora; capitula 1–1·5 cm. diametro :—
  Involucri bracteae exteriores ceteris multo breviores, rigide paleaceae; capitula corymboso-glomerata :—
    Folia longissima; capitula globoso-campanulata ... ... 1. *S. longifolium.*
    Folia superiora inferioribus multo breviora; capitula elongato-campanulata ... ... 2. *S. linifolium.*
  Involucri bracteae exteriores ceteris circiter dimidio breviores, herbaceae; capitula solitaria ... ... 3. *S. inopinatum.*
Folia laxe disposita, late linearia, internodiis aequilonga vel leviter longiora; capitula vix 0·5 cm. diametro ... ... 4. *S. oocephalum.*

1. **S. longifolium,** *Less.* Syn. Comp. 264 (1832); DC. Prodr. vi. 92; Drège, Zwei Pflanzengeogr. Docum. 123.

Tanacetum longifolium, Thunb. Fl. Cap. ed. Schult. 642 (1823). *Stilpnophytum linifolium,* var. *longifolium,* Harv. in Harv. et Sond. Fl. Cap. iii. 187.

South Africa.—South Western Region: George; Kayman's River Gat, in the forest below, 160 m., Sept., *Drège;* west side of Kayman's River, Aug., *Burchell* 5803; in the forest near Touw River, Aug., *Burchell* 5721. Uniondale; Long Kloof, mt. sides near the west bank of Wagenbooms River, Mar., *Burchell* 4931. "Cape," *Mund; Hooker; Thunberg.*

2. **S. linifolium,** *Less.* Syn. Comp. 264 (1832); DC. Prodr. vi. 92; Drège, Zwei Pflanzengeogr. Docum. 74.

Tanacetum linifolium, Thunb. Fl. Cap. ed. Schult. 642 (1823). *Stilpnophytum linifolium,* var. *brevifolium,* Harv. in Harv. et Sond. Fl. Cap. iii. 187.

South Africa.—South Western Region: Clanwilliam; Ezels Bank, heights 930–1320 m., Dec., *Drège* b. Karroo Region: Ceres; Koude Bokkeveld, at Sandrivier, 1480 m., Jan., *Schlechter* 10109. "Cape," *Thunberg.*

I have not seen Drège's *a* specimen from near Onzer in the Uniondale Div. (Drège l.c. p. 122); from the locality it is probably *S. longifolium.*

3. **S. inopinatum,** *Hutchinson*, sp. nov.

Suffrutex superne ramosus, usque ad 3 dm. altus (vel. ultra?); caulis erectus, costatus, glaber. *Folia* inferiora imbricata, linearia, acuta, 4–5 cm. longa, 1–2 mm. lata, coriacea, prominenter 1-nervia, glabra, superiora breviora. *Capitula* ad apices ramorum solitaria, corymbosa, pauca, late campanulata, circiter 1·3 cm. diametro. *Involucrum* 1 cm. longum; bracteae circiter 3-seriatae, exteriores herbaceae, lineares, acutae, carinatae, 5–6 mm. longae, glabrae, intermediae et interiores late lineares, rigide et crasse paleaceae, circiter 1 cm. longae, 2·5–3 mm. latae, margine minute ciliolatae, glabrae. *Flores* numerosi. *Corollae* tubus 4·5 mm. longus, inferne anguste cylindricus et dense glanduloso-pubescens, apicem versus sensim ampliatus, glaber; lobi 5, lineari-lanceolati, subobtusi, 1·25 mm. longi, glabri. *Achaenia* exteriora fertilia, 4·5–5 mm. longa, costata, nigrescentia, glabra, interiora vacua, anguste cylindrica, arcte costulata, glabra.

South Africa.—South Western Region: Swellendam; in the mountains near Swellendam, *Kennedy* 198.

This is a very distinct species and evidently very rare, for the collector found only a solitary specimen.

4. **S. oocephalum,** *DC.* Prodr. vi. 93 (1837); Harv. in Harv. et Sond. Fl. Cap. iii. 187.

South Africa.—South Western Region: Swellendam; on dry hills near the Breede River, Jan., *Burchell* 7462. *Caledon;* Attaquas Kloof, *Zeyher* 2822.

XXXII.—DIAGNOSES AFRICANAE: LXVIII.

1591. **Salacia Gerrardii,** *Harv. ex Sprague* [Hippocrateaceae]; affinis *S. Kraussii*, Hochst., a qua foliis oppositis cuspidatis, nervis lateralibus patulis venulis magis conspicuis differt.

Folia opposita, elliptico-oblonga vel ovata, basi rotundata vel obtusa, apice saepius conspicue sat abrupte cuspidata, 5–7·5 cm. longa, 2·8–4 cm. lata, obtusissime dentato-serrata; nervi laterales patuli, utrinsecus circiter 5, sat procul a margine arcuatim connexi, utrinque subtus magis conspicue; venulae supra obviae, subtus conspicuae; petioli 5–7 mm. longa. *Fasciculi* 2-pluriflori, interdum breviter pedunculati; pedicelli 0·8–1·2 cm. longi. *Sepala* transverse oblonga, ciliolata, duo exteriora 1·2 mm. longa, 1·7–2 mm. lata, tria exteriora vix longiora, 2·5–3 mm. lata. *Petala* patentia, suborbicularia, flavo-viridia (*Wood*) explanata 5–5·5 mm. diametro, exteriora subintegra, interiora laceratoquinquelobatus. *Stamina* intra discum inserta; filamenta deflexa, cuneata, 1·7 mm. longa, basi vix ultra 1 mm. lata, apice 0·4 mm. lata; antherae triangulari-reniformes, 0·6 mm. longae, 0·8 mm. latae, apice retusae, loculis inferne tertia parte liberae. *Ovarium* pyramidale, 1 mm. altum; stylus circiter 1 mm. longus; ovula pro loculo 2, superposita. *Bacca* (an matura) circiter

1·5 cm. diametro. *S. Gerrardii*, Harv. ex. J. M. Wood, Handb. Fl. Natal, 32 (1907), nomen. *Salacia* sp., J. M. Wood in Trans. S. Afr. Phil. Soc. vol. xviii. p. 139 (1908).

South Africa. Natal: without locality, *Gerrard* 1178; Nonoti, 150 m., *Wood* 8923; Mayville, *Wood* 13252; Inanda, *Wood* 567.

1592. **Cissus** (**Cyphostemma**) **flaviflora,** *Sprague* [Ampelidaceae]; affinis *C. cirrhosae*, Willd., a qua foliis trifoliolatis, foliolis apice rotundatis, indumento praesertim calycis breviore facile distinguitur.

Caulis plus minusve anfractuosus, internodiis 3-7 cm. longis. *Folia* breviter petiolata, trifoliolata; petioli 3–4 mm. longi, ut petioluli densiuscule pilosi; petioluli 2–3 mm. longi; foliola obovata, apice rotundata, in basin cuneatim angustata vel basi obtusa, 2-4 cm. longa, 1·5–2·5 cm. lata, nonnulla usque ad 5·5 cm. longa, 3·8 cm. lata, grossiuscule acute crenato-dentata, supra glabra, subtus nervis crispule pubescentibus. *Cymae* tribrachiatae, plerumque 5–6 cm. diametro; pedunculi 1–2·3 cm. longi, ut rhachis pedicellique dense crispule pubescentes; pedicelli 2 mm. longi. *Flores* tetrameri, flavi (*Wood*). *Alabastra* 2·5 mm. longa, medio constricta. *Calyx* breviter cupularis, 0·7 mm. altus, truncatus, ciliatus, extra parce pilosula. *Petala* ovato-oblonga. 3 mm. longa, basi 1·5–1·6 mm. lata, superne cucullata apice inflexa, extra crispule pubescentia. *Discus* annularis, 0·5 mm. altus, in lobos truncatos 0·7 mm. longos, basi 1 mm. latos apice 0·6 mm. latos productus. *Filamenta* 2·5 mm. longa, inferne supra disci lobos incurva, superne leviter recurva. *Ovarium* minute subappresse pilosum; stylus glaber in alabastro 1 mm. longus, ovarium versus valde incrassatus, post anthesin 1·5 mm. longus dimidio inferiore tumido superiore gracili; stigmata duo, minuta.

South Africa. Natal, *Gerrard* 572; near Durban, *J. M. Wood* 6392; Amanzimtoti, *J. M. Wood* 13249.

1593. **Lasiosiphon similis,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 73, anglice [Thymelaeaceae-Euthymelaeeae]; species *L. linifolio*, Decne, affinis, petalis minutis dentiformibus differt.

Caudex lignosus, ramis pubescentibus 8 cm. altis gerens. *Folia* alterna, lanceolata, acuta, 1·2 cm. longa, 3 mm. lata, utrinque pilosa, costa conspicua, nervi laterales utrinque circiter 2; folia involucrales ovata, acuta, 5 mm. lata. *Flores* capitati, terminales. *Calyx* extra appresse sericeus; tubus 1·2 cm. longus, subtus leviter inflatus; lobi breviter elliptici, obtusi, 3 mm. longi, 2 mm. lati. *Petala* minuta, dentiformia. *Antherae* oblongae, obtusae, 1·5 mm. longae. *Ovarium* oblongum, glabrum; stylus filiformis, calycis tubo brevior; stigma capitatum.

South Africa. Transvaal; Warmbaths, *Miss Leendertz* 1314.

This species resembles *L. Kraussii*, Meisn., but differs in having sessile flower-heads and much smaller petals.

1594. **Loranthus** (**Erectilobi**) **Buntingii,** *Sprague;* a ceteris speciebus sectionis corolla in alabastro superne marginibus loborum reduplicatis anguste alata distinctus.

Folia ovata vel elliptica, saepe breviter acuminata, apice recurva, obtusa vel rotundata, basi cuneata usque rotundata, 9–14 cm. longa, 6–9·5 cm. lata, coriacea, glabra; nervi laterales utrinsecus 2–3, sat irregulares, procul a margine bis vel ter anastomosantes, utrinque subtus valde elevati; petioli crassi, 6 9 mm. longi. *Umbellae* 5–7-florae; pedunculus 3–4 mm. longus, fovea angulata terminatus; foveae pedicellorum septis tenuibus separatae; pedicelli 2 2·5 mm. longi; bractea ovato-cupularis, margine dorsali 1 mm. longo anguste truncato, margine ventrali 0·5 mm. longo. *Torus* cum calyce campanulatus, 3 3·5 mm. longus, glaber. *Calyx* patulus, 1·5 mm. longus, irregulariter fisso-lobatus. *Corolla* in toto 5–7 cm. longa, glabra, parte apicali in alabastro incrassata acuta 7 mm. longa anguste alata; tubus viridis, circiter 2 cm. unilateraliter fissus, ampulla basali ellipsoidea 6 mm. longa: lobi pallide rosei, lineari-lanceolati, acuti, 1·4–1·5 cm. longi, extra 2·6 mm. lati, intus 1·3 mm. lati. *Filamenta* vix supra corollae loborum basin inserta, involuta, sursum sensim angustata, intus leviter excavata, dente ventrali excluso 7 mm. longa, dente 0·8 mm. longo; antherae anguste oblongae, 3 mm. longae. *Stylus* parte incrassata 8–9 mm. longa, collo 2·5 mm. longo, parte superiore papilloso; stigma ellipsoideum, 0·8 mm. longum.

Tropical Africa. Liberia: Mount Barclay, *Bunting* 165 (Herb. Mus. Brit. et Kew).

1595. **Loranthus** (**Infundibuliformes**) **Copaiferae,** *Sprague;* ab *L. loandensi*, Engl. et Krause, cui facie persimilis, corolla longa basi non inflata recedit; a ceteris speciebus corolla basi non inflata praeditis foliis distinguitur.

Ramuli satis graciles, leviter flexuosi, circiter 2·5 mm. diametro 30 cm. infra apicem, conspicue nodosi, subcinerei, subtiliter densiuscule lenticellati, glabri, novelli angulati, striati, vetustiores rugosuli; internodia 0·5–2·5 cm. longa. *Folia* alterna, obovata vel elliptica, apice obtusissima vel rotundata, interdum minute apiculata, basi cuneata, 2–3·2 cm. longa, 1–1·7 cm. lata, tenuiter coriacea, glabra, e basi vel supra basin trinervia; nervi supra promimentes, subtus saepius inconspicui; petioli 1·5–2 mm. longi. *Flores* in pulvinis conspicuis axillaribus fasciculati; pedicelli 1·7 mm. longi, glabri; bractea oblique cupularis, dorsaliter extra cornutum in lobum ut videtur truncatum producta, margine dorsali 2 mm. longo, ventrali 1·3 mm. longo. *Torus* cum calyce cylindrico-campanulatus, 6 mm. longus, circiter 2·5 mm. diametro. *Calyx* truncatus, parce cililatus, ceterum glaber, 4 mm. longus. *Corolla* 6·2 cm. longa, glabra; tubus subcylindricus, sursum leviter ampliatus, circiter 4·7 cm. longus, circiter 2 cm. deorsum unilateraliter fissus; lobi erecti, e basi latiore lineares, acuti 1·4 cm. longi, infra insertionem staminum 1·8 mm. lati, medio circiter 1 mm. lati, extra inferne carinati, ceterum convexi. *Filamenta* erecta, sursum angustata, superne incrassata, 6·5 mm. longa, basi 1·3 mm. lati, apice 0·7 mm. lati, intus triente superiore excepta bicostata, inter costas conspicue sulcata; antherae

lineares, 3·7 mm. longae. *Discus* circiter 0·5 mm. altus, obtuse pentagonus. *Stylus* inferne leviter incrassatus, superne leviter metuliformis, collo 4 mm. longo; stigma ovoideum, 0·8 mm. longum.

Tropical Africa. Angola: Loanda; Guisua, on young copal trees (*Copaifera*), *Gossweiler* 14 (Herb. Mus. Brit.).

1596. **Loranthus usuiensis,** *Oliv.*, var. **Maitlandii,** *Sprague* [Loranthaceae]; a typo foliis angustioribus necnon corolla forma differt.

Folia plus minusve anguste lanceolata, 6–12 cm. longa, 1·5–3·5 cm. lata, obtusa. *Corollae* ampulla basalis ellipsoidea.

Tropical Africa. Uganda, *Maitland* 119 (type); *Small* 1150.

The narrowly lanceolate leaves of *Maitland* 119 give the plant a very different appearance from typical *L. usuiensis*, so that at first sight it looks like a distinct species. *Small* 1150 has broader leaves, however, and though both specimens are more glabrescent than typical *usuiensis* and differ in the shape of the basal swelling of the corolla, it seems better to treat them as a variety of *L. usuiensis*. The shape of the basal swelling does not appear to be a very reliable character (see Fl. Trop. Afr. vol. vi. sect. 1, p. 304, note under *L. Braunii*).

1597. **Loranthus** (**Infundibuliformes**) **Crataevae,** *Sprague;* affinis *L. trinervio*, Engl., et *L. brunneo*, Engl.; ab illo ramulis non verrucosis, foliis floribusque multo majoribus, ab hoc corolla basi inconspicue ampliata tantum, parte incrassata apicali in alabastro costata apiculata differt.

Ramuli cinerei, laeves, circiter 3·5 mm. diametro 20 cm. infra apicem, vetustiores dense at inconspicue lenticellati. *Folia* subsessilia, elliptico-oblonga vel ovato-oblonga, basi obtusa 10–13 cm. longa, circiter 5 cm. lata, trinervia, nervis utrinque praecipue subtus prominentibus, nervis tertiariis extra nervos laterales utrinque circiter 9, initio patulis, sat procul a margine arcuato-anastomosantibus, areas subrhomboideas includentibus. *Umbellae* sessiles, plurifloraे; pedicelli 2·5 mm. longi, in basin ampliati; bractea cupularis, ciliolata, margine dorsali in lobum plus minusve producto 2–2·5 mm. longo extra plus minusve acute umbonate: margine ventrali 1–1·5 mm. longo. *Torus* cum calyce 4 mm. longus, cylindrico-campanulatus, extra glaber. *Calyx* 2·5 mm. longus, 5-dentatus, ciliolatus. *Corolla* in toto 5·2–5·8 cm. longa, rubra, in alabastro tubo inferne cylindrico superne leviter inflato, parte apicali incrassata 6 mm. longa, oblonga, costata, in basin leviter angustata, in apicem angustata, apiculata; tubus 1·3–1·4 cm. unilateraliter fissus; lobi in toto 1·25 cm. longi, parte inferiore lineari, parte superiore latiore lineari-lanceolata acuta intus strato duro praedita. *Filamenta* circiter 1 mm. supra basin corolla loborum inserta, deflexa, 6·5 mm. longa, intus bicostata, apice leviter incrassata, a medio in basin sensium ampliata; antherae lineari-oblongae, truncatae, 2·7 mm. longae. *Stigma* ovoideum, fere 1 mm. longum.

Tropical Africa. Uganda: near the Semliki river, on *Crataeva*, *Bagshawe* 1303 (Herb. Mus. Brit.).

1598. **Loranthus** (**Infundibuliformes**) **toroensis,** *Sprague;* affinis *L. trinervio*, Engl., et *L. djurensi*, a quibus calyce duplo longiore recedit.

Ramuli sat graciles, 2·5 mm. diametro 20 cm. infra apicem, nodosi, densiuscule lenticellati, internodiis 0·5–2 cm. longis. *Folia* alterna, ovato-oblonga vel lanceolata, apice acuta, basi obtusa vel subcuneata, 3·5–6·5 cm. longa, 1·3–2·6 cm. lata, coriacea, glabra, trinervia, nervis utrinque praecipue supra elevatis, lateralibus paullum supra basin ortis, tertiariis inconspicuis; petioli 2–3 mm. longi. *Umbellae* sessiles, 2–3-florae; pedicelli brevissimi, vix ultra 0·5 mm. longi; bractea cupularis, postice in lobum anguste truncatum vel retusum bicuspidatulum producta, sparse ciliolata, margine ventrali 2–2·5 mm. longo, margine dorsali 3 mm. longo extra plus minusve incrassato. *Torus* cum calyce subcylindricus, 5–5·5 mm. longus, extra glaber. *Calyx* subtruncatus, ciliolatus, inconspicue 5-dentatus, 3·5–4 mm. longus. *Corolla* in toto circiter 5 cm. longa; tubus sordide ruber, inferne leviter ampliatus demum angustatus, superne inflatus, unilateraliter 1–1·2 cm. fissus; lobi lutei, superne rubelli, subspathulato-lineares, 1·1–1·2 cm. longi, superne intus strato duro praediti. *Filamenta* 2–3 mm. supra basin corollae loborum inserta, deflexa, 5·5 mm. longa, sursum sensim angustata, intus inferne late sed inconspicue unicostata; antherae lineares, 3 mm. longae. *Stigma* ovoideum, 0·5 mm. longum.

Tropical Africa. Uganda: Toro; near the mouth of the Mpanga river, 900 m., on *Dombeya* sp. and *Acacia* sp., *Bagshawe* 1157 (type), 1237 (Herb. Mus. Brit.).

1599. **Encephalartos ferox,** *Bertol. f.* in Mem. Accad. Sci. Bologn. vol. iii. p. 264 (1851); Engl. Pflanzenw. Ost-Afr. C, p. 92 (1895); De Wild. Ic. Hort. Then. vol. iv. p. 181 (1904) [Cycadaceae-Encephalarteae]; species *E. grato*, Prain et *E. Hildebrandtii*, A. Br. & Bouché, proxima; ab illo foliolis haud falcatis apice 2–4-spinescentibus, ab hoc foliolis basi valde inaequalibus seminibus atris nec cinnabarinis differt.

Caudex subglobosus circiter 6 dm. altus 3 dm. diametiens. *Folia* ultra mediam partem 2·5 dm. lata; rhachis subcylindracea; foliola rigide coriacea, ovato-oblonga, apicem versus opposita, ceterum alterna, 10–15 cm. longa, 4·5–5 cm. lata, basi valde obliqua ibique margine superiore rotundata margine inferiore anguste cuneata, apice 2–4-spinescentia, margine utrinsecus grosse 2–4-dentata dentibus late triangularibus divergentibus spinescentibus. *Strobilus foemineus* subsessilis, oblongo-ellipsoideus, ruber. *Semina* atra.

Tropical Africa. Portuguese East Africa: Mozambique, *Fornasini.*

There is, unfortunately, little to add to the account of this species given by Professor Bertoloni in 1851; no specimens have been communicated since the original material was transmitted by Fornasini to Bologna sixty-five years ago. Through the kind efforts of Professor Schinz, of Zurich, and Professor Morini, of Bologna, our wish to learn what is to be known with regard to this

plant has been brought to the notice of Professor Antonio Bertoloni, of Zola Predosa, Bologna, and to his generosity we are indebted for a water-colour drawing of a portion of one of the two leaves on which his grandfather's account of the species was partly based. The opportunity of learning the precise shape of the leaflets of the plant met with by Fornasini makes it possible to compare more precisely the characters these afford with the corresponding characters in the remaining tropical African species of the genus and to supply a brief diagnosis, in which these characters are taken into account and are contrasted with the corresponding characters in the two tropical species to which *E. ferox* seems most nearly allied.

1600. **Encephalartos gratus,** *Prain* [Cycadaceae-Encephalarteae]; species *E. Laurentiano*, De Wild. et *E. Woodii*, Sand. proxima, ab illo foliolis margine paucidentatis, ab hoc foliis hebetibus nec nitidis facillime distinguenda.

Caudex saepius brevissimus, globosus vel ellipsoideus, nonnunquam omnino hypogaeus, 3-4 dm. altus, 3 dm. diametiens, rarius et praesertim in plantis masculis evolutus, 1·25 m. usque altus, 0·7 m. diametro, invicem squamis coriaceis et petiolorum basibus persistentibus imbricantibus tomento floccoso indutis obsitus. *Folia* 1·2–1·8 m. longa, ultra mediam partem 3 dm. lata, saturate viridia; petiolus rhachisque subcylindracei persistenter floccosi; foliola rigide coriacea, 30–70-juga, ovato-lanceolata, distincte falcata, 1·7–2·5 dm. longa, 3 cm. lata, basi valde obliqua ibique margine superiore late cuneata vel rotundata margine inferiore anguste cuneata, apice acute acuminata pungentia, per marginem inferiorem grosse 1–4-dentata, prope basin in margine superiore grosse 2–4-dentata, dentibus late triangularibus pungentibus subdivaricatis; casu foliola apice 2-spinosa, vel in exemplis juvenilibus 4–5-spinosa. *Strobilus maris* pedunculatus, anguste ovatus vel cylindraceus, viride-lutescens, maculis rubris notatus, demum sordide brunneus, 3–4 dm. longus, 8–10 cm. latus; pedunculus 15–17 cm. longus; squamae patentes latiuscule obovato-deltoideae, parte fertilis 2 cm. longa, subquadrata, parte sterili apice rhomboidea 2 cm. lata, angulis lateralibus acutis caeteris obtusis, summo nonnunquam fere obsoleto, subumbonata. *Strobilus femineus* pedunculatus, viridi-lutescens, demum sordide brunnescens, subcylindraceus vel anguste conicus, 5·5-6 dm. longus, 1·5–2 dm. latus; pedunculus 12–14 cm. longus; squamarum apex late rhomboidea, 5·5 cm. lata, 3 cm. alta, angulis lateralibus explanatis, caeteris obtusis, umbonata. *Semina* ellipsoidea vel ovoidea, plus minusve angulata, 3·5–4 cm. longa, 1·4–2 cm. lata; testa sordide cinnabarina.

Tropical Africa. Mozamb. Dist.: Nyasaland; south-eastern Mlangi, between the Puchila and the Ruo Rivers, 850 m., *Mahon;* lower slopes of Mt. Mlangi, 650–900 m., *Davy;* Zomba, cultivated, *McClounie, Davy.*

Specimens of a male example of this species were first sent to Kew by the late Mr. J. Mahon from Nyasaland in 1899. Living plants were sent to Kew by Mr. McClounie in 1903 [n. 197] and by Mr. Davy in 1914 [n. 417]. Copious notes, with material of the

flowers of both sexes, and a series of photographs, communicated by Mr. Davy in 1916, have rendered it possible to provide a complete description. It is, Mr. Davy informs us, most common in rocky ravines and along rocky river-banks, frequently in crevices between rocks without any apparent soil. It is usually subject to intense insolation and is often under water for a few hours in heavy floods. The area on the slopes of Mlangi to which it is limited has an annual rainfall of 1250–1750 mm., with a mean temperature for the year of between 95°–100° F. and a minimum temperature of 45°–50° F. Occasional specimens are found in savannah forest, and even in dense forest in rich soil. In savannah tracts the plants are usually defoliated by bush fires every year. The stem is generally short and globose, rarely rising more than a foot above the soil, often it is wholly underground. When growing in rich soil in shade the stems tend to become cylindric and may be up to 4 ft. high. This appears to occur most frequently with male plants. The pinnules of *E. gratus* in shape most resemble those of *E. Laurentianus*, De Wild., of Uganda and the Belgian Congo, among the tropical species of the genus. The scales of the male cones, however, are readily distinguishable from those of *E. Laurentianus* and approach those of *E. Barteri*, Carruth., of Upper Guinea, and of *E. Poggei*, Aschers., of the Belgian Congo, two species with foliage quite unlike that of *E. gratus*. The species with which *E. gratus* agrees most closely as regards the size, shape and marginal toothing of the pinnules is one from Zululand of which neither male nor female cones are yet known, first met with at Ngoya in 1895 and thence introduced to the Natal Botanic Garden in 1899 [*E. Woodii*, Sand. Gard. Chron. 1908, vol. xliii. pp. 257, 273 with suppl. fig.; J. M. Wood, l.c. p. 414; Kew Bulletin, 1914, p. 250, with fig. = *E. Altensteinii*, var. *bispinosa*, J. M. Wood, Rep. Bot. Gard. Natal, 1906–7, p. 8 with fig.]. When grown side by side *E. gratus* and *E. Woodii* are readily distinguishable; the foliage of *E. Woodii* is bright green and polished, that of *E. gratus* is dark green and dull. Another species with which *E. gratus* agrees as regards the shape of the base of the leaflets is *E. ferox*, Bertol. f., from Mozambique; in *E. ferox*, however, the leaflets are much shorter and wider and are not falcate, while the seeds are black, not vermilion. No economic properties are attributed to *E. gratus*, nor has Mr. Davy been able to ascertain that it has any definite vernacular name.

XXXIII.—MISCELLANEOUS NOTES.

The Botany of Tapu-ae-nuku, New Zealand.—The following letter relating to an ascent of Mount Tapu-ae-nuku and the plants found thereon has been recently received from Mr. B. C. Aston, Government Chemist, New Zealand:—

"Since I last wrote you I have continued my explorations of the Inland Kaikoura Mountains which culminated in the ascent of Tapu-ae-nuku (9467 ft.), the highest mountain in the northern part of the South Island. Tapu-ae-nuku, or more properly Tapu-ae-nenuku, means the footsteps of 'Nenuku,' the

Maori God of the Rainbow; and the noise of avalanches of rocks, ice, snow, etc., and of thunder, was thought by the superstitious Maori to be the sound of his footsteps. The Pakeha (white man) has named the mountain Mt. Odin with some appropriateness, but this name only appears on a few maps, and never in settlers' conversation, by whom it is familiarly known as 'Tappy.' It is somewhat extraordinary that, although Marlborough was the first province to be botanised in New Zealand (viz., Cook, Banks and Solander in Queen Charlotte Sound in 1777, and the Owatese Valley which has had more visits paid to it by botanists than most other valleys in New Zealand), that Tapu-ae-nuku should never before have been ascended by a botanist. Perhaps it has a reputation for difficulty of ascent which is somewhat undeserved. With caution at the right time of the year there should be no difficulty in any active man reaching the summit from the 3000 ft. camp in the bed of the Dee River and returning in twelve hours. With three companions, Dr. I. Allan Thomson, Mr. H. Hamilton (both of the Dominion Museum Staff, Wellington), and Mr. A. F. O'Donoghue, the well-known amateur guide of Blenheim, I left the bivouac under an immense tabular rock in the Dee River bed at 3000 ft. about 6 a.m. on 29th February, 1916, and we returned to the same level in an adjoining valley about the same time in the evening. Our ascent was, of course, somewhat retarded by stoppages for specimen and note taking, but we reached the summit about 3 p.m., leaving about half an hour later. Our descent of 6000 ft. in three hours was facilitated by huge shingle slips upon which good time was made The most important botanical discovery of the trip was the finding the 'vegetable sheep' (*Haastia pulvinaris*) growing at an altitude of 8500 ft.—a most extraordinary extension of its altitude, authorities giving its limit at 6500 ft. It has always been considered one of the most remarkable plants of the world, and the fact of its growing within 1000 ft. of the summit of Tapu-ae-nuku will add to the wonder with which it is regarded. In this highest station it is undoubtedly not a shingle plant, but a rock plant growing on the precipitious northern side of the twin peak of Tapu-ae-nuku. For a full description of the vegetative organs of this plant, see Laznievski [' Bietrage zur Biologie der Alpenpflanzen ' Flora, 1896, 82 bd. heft iii.] and Low [Trans. N.Z. Inst., vol. 32, 1899, p. 150]. The plants of the shingle slips were very interesting and comprised *Stellaria Roughii*, *Ligusticum carnosulum*, *Lobelia Roughii*, *Poa sclerophylla*, and *Wahlenbergia cartilaginea*. Except the grass, they were invariably fleshy in character and slaty-coloured to harmonise with the shingly surroundings. Occasionally the grass would be found to revert to the usual green colour, and then it was badly eaten possibly by insects. It was only by the closest search that plants could be detected on these giant shingle slips which in places, stretched for 2000 ft. or more up the mountain, the protective coloration of the plants being well-nigh perfect.

"On the highest parts of the mountain several species new to the Province of Marlborough were collected. Perhaps the feature which will most appeal to future botanical visitors to

this wild country, which can at present only be approached by means of a bridle track—there being no road—are the wonderful wall gardens of the Amuri limestone and banded flint gorges and canyons through which the rivers of the high range have cut their courses. To understand the physiography of this area one should consult Dr. C. A. Cotton's paper in the *Geographical Journal*, vol. 42, No. 3, Sept., 1913, 'The Physiography of the Middle Clarence Valley, N.Z.' [On p. 234, fig. 7, is a photo of Tapu-ae-nuku, which shows in the centre the spur by which we ascended to the summit, also the immense shingle beds below the snow; it also shows the twin peak a little below the summit on which the *Haastia* grows to its summit practically.]

"In places in these calcareous cliff faces, where the dip of the strata is such as to afford a lodgment to plants, the faces are dotted all over from the river bed to the top, some 200-400 ft., with species many of which are peculiar to this north-east corner of the South Island and which plant lovers would esteem as some of the most beautiful of flowering plants. Prominent are *Olearia insignis*, *Celmisia Munroi*, *Ranunculus Munroi*, *Clematis afoliata*, *Ligusticum filiformis*, *Notospartium torulosum*, *Angelica Gingidium*, *Olearia coriacea*, *Senecio geminatus*, *Wahlenbergia saxicola* var., *Veronica Hulkeana*, *Gentiana Astoni*, *Veronica leiophylla*, *Carmichaelia Munroi*, *Leptospermum scoparium* var.

Echium Pininana.—Several species of *Echium* peculiar to the Canary Islands are of arboreal habit. Dr. G. V. Perez informs us that he has growing in his garden at Villa Orotava, Tenerife, 1200 ft. above sea-level, a plant of *Echium Pininana*, Webb, $21\frac{2}{3}$ ft. high, which is probably a record for the genus. De Coincy (Bull. Herb. Boiss. ser. 2, vol. iii. p. 272), describes *E. giganteum*, Linn. f., as attaining a height of 13 ft., whilst *E. Pininana* in the Temperate House at Kew is now $11\frac{1}{2}$ ft.

Mangrove Wood.—Several attempts have been made recently to induce railway companies to use the wood of the mangrove (*Rhizophora Mangle*, L.), for sleepers, but as the mangrove is usually a small tree, it is likely that greater success would attend the introduction of the wood if it could be utilised for some purpose where timber of smaller dimensions is in demand. Mangrove wood might be used successfully for pit props and other mine timber since the wood is both strong and durable; it is, however, heavy, a disadvantage where freight is concerned. As the sleepers in question were shipped from West Africa, it might be possible to import a cargo of the smaller-sized wood cut to suitable lengths for trial for pit props. The weight of the wood appears to range between 48 lbs. and 65 lbs. a cubic foot.

W. D.

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V.—Wild Fauna and Flora of the Royal Botanic Gardens. Price 2*s*. By post: United Kingdom, 2*s*. 5*d*.; Foreign and Colonial, 2*s*. 5*d*.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 8] [1916

XXXIV.—THE EXHALATION OF SCENT BY THE FLOWERS OF MICHELIA FUSCATA.

L. A. Boodle.

The flowers of *Michelia fuscata*, Blume (*Magnoliaceae*), are strongly scented at times, their odour being very similar to that of amyl acetate.

Observations have been made by Mr. W. L. Lavender on a plant of this species in the Temperate House at Kew, in relation to the scent of the flowers, and the results obtained by him are given below.

Flowers were examined on several days, five or six times each day from 6.30 a.m.* until 5.30 p.m. The records as to scent are set out separately for each day, beginning only at 11.30, because scenting of flowers was not noticed before that time. Notes on atmospheric conditions are added.

May 1†—Bright at 9.30.

11.30—Dull, warm ...	Slight scent.
2.30—Bright... ...	Strong scent.
5.30— „	Less strong.

May 3‡—Bright, 6.30–5.30.

11.30—Slight scent.
1.30—Fairly strong.
2.30—Strong.
5.30—Slight.

May 4—6.30–9.30—Dull, wet.

11.30—Dull	No scent.
1.30—Bright... ...	Slight scent.
5.0 — „	Strong.

May 5—Bright, 6.30–5.30.

11.30—Slight scent.
2.30—Strong.
5.30—Fairly strong.

* The experiments were made in the year 1915 and the times are therefore normal.

† A flower, picked off at 6.30 a.m. and placed on paper in a rather warmer atmosphere, was strongly scented at 11.30 a.m.

‡ A flower, picked at 6.30 a.m. and treated as in the experiment of May 1st, was strongly scented at 11.30 a.m., but had lost all its scent by 4 p.m.

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May 6—6.30–9.30—Bright.

11.30—Bright, close ...	Slight scent.
2.30— „ „ ...	Strong.
5.30— „ „ ...	„

May 18—6.30–5.30—Dull, cold, wet.

11.30—No scent.	
2.30— „ „	
3.30—Slight scent.	
5.30— „ „	

May 20—Dull, showery. No scent before 2 p.m. and then only slight.

The conclusions arrived at are as follows. On bright days the scent is strongest from 2.30 p.m. to 5 p.m., and then gradually diminishes. On dull days the scent is not so strong as in bright weather, and exhalation begins later.

When the morning is wet and cold, and the afternoon bright, the scent develops later and apparently remains later.

Flowers picked off and kept at a rather higher temperature on paper become scented about an hour before those left on the tree.

With the object of obtaining further data as to the influence of external conditions on the production of scent by the flowers of *Michelia*, some experiments were made in the Jodrell Laboratory. Cut flowers, with their stalks placed in water, were used, and in most cases four lots of three or four flowers each were arranged under different conditions, *e.g.*, one set of flowers in the dark, one in shade,* another in sunlight, and another in a very damp atmosphere,† either in sunlight or in shade.

The results of the experiments show that light, and moisture have a marked influence on the exhalation of the scent, which is produced only during a few hours at a time.

The scent is given off almost entirely by the perianth-leaves, but in two cases a very slight scent was detected in the central part of the flower (stamens and pistil), after the perianth leaves had fallen off. The scent of a flower may recur on two or three days, and besides this the perianth-leaves may become scented on the following day after they have dropped, or even on the second day.

The experiments were mostly begun soon after 10 a.m., the flowers being then without scent. The earliest development of scent was observed shortly before 11 a.m.

Similarly treated specimens from a batch of flowers of apparently the same age often behave somewhat differently. It is necessary therefore to repeat an experiment three or four times when only small numbers of flowers are used.

Damp air, as compared with dry, causes earlier exhalation of the scent. This was tested in sunlight and in shade, and the differences observed were from half-an-hour to one hour in the sun, and from half-an-hour to two hours in the shade. The favourable influence of moisture was shown also by the fact that damp air gave a greater proportion of scented and also of

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* For the shade experiment the flowers were placed close to a north window.

† The flowers in this case were put under a small bell-jar in which the air was kept near saturation-point by means of damp blotting-paper.

strongly-scented flowers. The combined result of five experiments was:—In damp air, 5 flowers with strong scent, 3 fairly strong, 2 slight; in dry air, 2 fairly strong, 4 slight. Three of these experiments were made in shade and two in sunlight.*

A comparison of the behaviour of flowers in sunlight and in shade shows that sunlight favours the production of scent, both as regards earlier occurrence, number of flowers, and strength of odour. In four experiments the difference of time was from half-an-hour to two hours, and the numbers of flowers were:—In sun, 2 with strong scent, 8 fairly strong, 2 slight; in shade, 1 fairly strong, 6 slight.

Flowers kept in the dark were found to remain unscented in most cases. In experiments made on five days, when strong or fairly strong scent was produced in light, flowers in the dark did not become scented except on one day, and then only slightly.

In relation to the production of scent, the following appears to be the sequence of conditions from favourable to unfavourable: sun and damp, sun, shade and damp (often about equal to sun), shade, and lastly darkness.

The shade temperature in the Laboratory was 52° F. on the coldest day, and 70° F. on the hottest. These differences probably had some influence on the production of scent. A detailed comparison of the results belonging to different days would not, however, bear this out, one reason being that the brightness of the light varied to a great extent with the temperature. It may be noted, however, that on the hottest day, though this was not quite the brightest, a slightly earlier exhalation of the scent was recorded than on any other occasion, and that decided lateness of scent was observed on two of the coldest though fairly bright days.

A few experiments were made with temperatures above and below the normal range. In one case, flowers were kept in air cooled by ice to a temperature varying from 40° F. to 50° F., other flowers being in the Laboratory air at about 70° F. Exhalation of scent began at 11.30 a.m. from the flowers at the higher temperature placed in damp air, and at 12.30 p.m. from those in dry air, but in the cooled air no scent had developed by 2.30 p.m. The ice was then removed, and the flowers from the cooled air were placed in sunlight, with the result that two of them became slightly scented by 4 p.m. On experimenting with flowers on two or three days in a greenhouse in darkness it appeared that a temperature of 75° to 80° F. slightly diminished the unfavourable influence of darkness on the production of scent, *i.e.*, as compared with the lower temperatures of the Laboratory experiments.

In one case heat was applied to some flowers towards the end of the day to see whether the scent would be revived. There were three lots of flowers, which were placed at 11 a.m. in sunlight, shade and darkness respectively. Scent was noticeable at noon in the sunlight, and at 12.30 p.m. in the shade, but

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* These results may be due in part to a possible increase of the olfactory action of a given amount of the scent when distributed in damp air.

was not developed by the flowers placed in the dark. By 8 p.m. it had practically ceased in both lots of flowers exposed to the light, and entirely before 9 p.m. The three lots were then put into an oven with a temperature of 92°–100° F., and kept there until 11 p.m., but in no case was any scent developed.

An interesting feature was noticed in some of the experiments. When the same flowers were used on two successive days, it was found that an after-effect of the behaviour of the flowers on the first day may sometimes be recognised on the second day. For instance, in one experiment, flowers placed in sunlight became strongly scented, while others placed in the dark produced no scent. On the following day both lots were exposed to sunlight, and the flowers which had been in darkness on the first day became scented two hours earlier than the others. Another experiment gave a similar result with a difference of two hours and a half, and with stronger scent in favour of those flowers which had previously been in the dark.

In explanation of this phenomenon it is suggested that possibly a non-volatile substance, which yields the scent under certain external conditions, accumulates gradually (or chiefly during the night) in the cells, but becomes exhausted during energetic exhalation of scent.

The exhalation of scent probably takes place chiefly through the stomata of the perianth-leaves, but, in view of the favourable effect of damp air, it is maintained that the manufacture and not only the exit of the scent is concerned in the phenomena observed.

XXXV.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECAS LXXXIX.

881. **Rosa (Cinnamomeae) elegantula,** *Rolfe;* affinis *R. sertatae*, Rolfe, ramis juvenilibus copiose et graciliter aciculatis et floribus duplo minoribus facile distinguenda.

Frutex ramosus, mediocris; ramuli subglabri, saepissime copiose aculeati, rarius subinermes. *Folia* conferta, 5–8 cm. longa, 7–9-foliolata; rhachis sparse glandulosa et aculeolata; foliola subsessilia, elliptica vel ovato-elliptica, obtusa, acute et simpliciter dentata, rarius subduplicato-serrata, utrinque glauca, 1–2 cm. longa; stipulae adnatae, anguste oblongae, obtusae vel subobtusae, minutissime ciliato-glandulosae, 5–6 mm. longae. *Flores* speciosi, saturate rosei, 2·5–3 cm. diametro, in ramulorum brevium apicibus solitarii vel pauci; pedunculi 2 cm. longi, laeves. *Receptaculum* anguste ovoideo-oblongum, laeve, 5-6 mm. longum. *Calycis* lobi ovato-lanceolati, caudato-acuminati, interdum subfoliacei, puberuli, minutissime ciliolati, rarissime glandulosi, circiter 1 cm. longi, patentes. *Petala* late obcordata. *Filamenta* glabra, 2–3 mm. longa, antheris aureis. *Styli* villosi, in columnam 2 mm. longam cohaerentes.

China: *Wilson* 1165, 1280 (ex hort. Veitch).

A very pretty little rose, readily distinguished from *R. sertata*, Rolfe (Bot. Mag. t. 8473), by its copiously aciculate branches and by the much smaller flowers with very deep carmine-rose petals. The plants were grown from seeds collected by Mr. E. H. Wilson for Messrs. James Veitch & Sons, with whom it flowered in June, 1908, and subsequently at Kew.

882. **Carelia Berroi,** *Hutchinson* [Compositae-Eupatoriaceae]; species ramulis glabrescentibus, foliis lanceolatis, involucri bracteis glabris distincta.

Ramuli superne dense foliati, fere glabri. *Folia* opposita, lanceolata, apice sensim acuminata, basi breviter cuneato-obtusa, 2–5 cm. longa, 0·5–1·7 cm. lata, serrata, tenuiter chartacea, utrinque nervis parce puberulis exceptis glabra, infra prominulis, punctata, basi trinervia, nervis subparallelis infra prominulis; petioli 0·5–1·4 cm. longi, supra sulcatuli, fere glabri. *Capitula* numerosa, in corymbos densos ramulis dense foliatis circumdatos disposita; pedunculi ultimi 1–1·5 cm. longi, leviter angulares. *Involucri bracteae* 4-seriatae, ab extremo sensim longiores, exteriores late ellipticae, apice rotundatae, circiter 3 mm. longae, interiores oblongae, usque ad 8 mm. longae, omnes dorso sulcatae, parte superiore minute puberulae, marginibus membranaceis minutissime denticulatis. *Receptaculum* rotundatum, parvum, glabrum. *Flores* numerosi, albicantes; corollae tubus 3·5 mm. longus, superne sensim ampliatus, glaber. *Achaenia* 5-angulata, 3·5 mm. longa, apicem versus parce appresse pubescentia. *Pappi paleae* breves, stramineae, apice laceratae.

Uruguay. Cerro del Marco, amongst dry rocks, Dec., 1907, *M. B. Berro* 4554.

883. **Crepis bhotanica,** *Hutchinson* [Compositae-Cichoriaceae]; affinis *C. blattarioidei*, Vill., sed foliis radicalibus sub anthesin viridibus (nec marcescentibus) caulinis basi rotundato-auriculatis, caulibus et involucri bracteis extra ubique nigro-pilosis differt.

Herba circiter 0·5 m. alta; caulis superne ramosus, dense nigro-pilosus. *Folia* radicalia longe petiolata, oblanceolata, basin versus sublobulata, apice obtusa, petiolo incluso usque ad 20 cm. longa, 3·5–4 cm. lata, tenuiter chartacea, remote repando-denticulata, utrinque praecipue in costa et nervis pilosula, laxe reticulata; folia caulina lanceolata, basi rotundato-auriculata, usque ad 12 cm. longa, repando-dentata et interdum lateraliter lobulata. *Capitula* nutantia, flava, longe pedunculata, pedunculis plerumque gracilibus pilosis usque ad 12 cm. longis apicem versus parce bracteatis. *Involucri bracteae* subtriseriatae, exteriores anguste lineares, 6–7 mm. longae, intermediae paullo longiores, interiores circiter 1·5 cm. longae, acute acuminatae, omnes extra dense nigro-pilosae. *Corollae* apices et styli rami conspicue nigri. *Achaenia* immatura glabra. *Pappi* setae albae, 1 cm. longae.

India. Bhotan: described from living specimens grown from seed communicated by Messrs. Bees, Ltd.

This species is very closely related to certain Kashmir specimens described in the Flora of British India as *C. blattarioides*, Vill., a plant of Central and Western Europe. It differs from the Kashmir species, which seems to be distinct from the European, in its narrower upper cauline leaves, slender, not thickened peduncles, and nodding capitula; and from the European *C. blattarioides* in having at the time of flowering the basal leaves quite fresh and not withered as in that species and in its rounded-auriculate, not sagittate-auriculate, cauline leaves.

884. **Phoebe goalparensis,** *Hutchinson* [Lauraceae-Perseaceae]; affinis *P. Hainesianae*, Brandis, sed costa infra basin versus puberula (nec appresse pubescente), nervis tertiariis irregulariter ramosis, alabastris acutioribus differt.

Arbor alta, trunco paullo ramoso basi radicibus aeriis ornato, cortice viridi; ramuli ultimi minute puberuli, nigrescentes, lenticellis parvis parce instructi. *Folia* obovata vel obovato-lanceolata, basi angustata, apice sensim obtuse acuminata, 6–12 cm. longa, rigide chartacea, utrinque costa basin versus puberula excepta glabra; costa supra impressa, infra prominens; nervi laterales utrinsecus 10–12, a costa sub angulo 45° abeuntes, supra vix, infra distincte prominuli, prope marginem evanidi et flexuosi; nervi tertiarii utrinque prominuli, flexuosi; petioli 1–2·5 cm. longi, infra glabri, supra minute puberuli. *Inflorescentiae* laxe paniculatae, ramulorum apices versus subcongestae, foliis aequales vel leviter superantes, longe pedunculatae; pedicelli ultimi circiter 0·5 cm. longi, cinereo-puberuli, sicco costati; bracteolae minutissimae, caducae. *Alabastra* ovoidea, 6–7 mm. longa. *Perianthii* lobi exteriores ovati, obtusi, 4 mm. longi, 3 mm. lati, coriacei, extra puberuli, intra basin versus appresse villosuli, interiores paullo longiores, infra apicem pilis inflexis paucis ornati. *Stamina* gracilia, filamentis pubescentibus, ordinis I. et II. 4 mm. longa, antheris oblongo-ovoideis obtusis 1·5 mm. longis; ordinis III. paullo longiora, basin versus glandulis geminatis cordatis instructa; staminodia ordinis IV. sagittata, staminibus dimidio breviora. *Ovarium* depresso-globosum, pubescens; stylus 1 mm. longus. *Bacca* ellipsoidea, nitida, 2·5 cm. longa, glabra.

India. Assam: Goalpara district; Aie Reserve, stem buttressed at the base, fls. Feb., fr. July, *Upendranath Kanjilal in Dehra Dun Herb.* 5092.

Vernacular—*Nikáhi.*

885. **Dioscorea asclepiadea,** *Prain et Burkill* [Dioscoreaceae]: species e sectione *Stenophora*, *D. gracillimae*, Miq. affinis, foliis hebetibus nec nitidis, inflorescentiis maris laxis nec spicatis sejungenda.

Rhizoma ut videtur horizontale. *Caules* glabri, 5–6 dm. tantum alti, penna anserina vix crassi, ima basi arcuati ibique

cataphyllis 2 membranaceis 5 mm. longis suffulti, per trientes inferiores duos more culmi holci erecti stricti, triente summo flexuosi et sextante summo tantum sinistrorsum volubiles, teretes, inermes, siccitate straminei. *Folia* alterna, 2–3 inferiora aggregata rarissime tamen subopposita, caetera manifeste sparsa, membranacea, supra saturate subtus pallidiore viridia, hebetia, etiam novella utrinque glaberrima, nisi reticulatione pellucida opaca, subdeltoideo-cordato-oblonga, acute acuminata, apice minutissime mucronulata, sinu basali lato, margine penitus minutissime undulata et supra auriculas basales parum obliquas leniterque iterum sublobulatas aliquantulum sinuata, 7-nervia nervis extimis 2-fidis, nervi opaci subtus prominuli, nervuli secundarii pellucidi, supra obscuri subtus subdistincti; 6–7 cm. longa, basi 4 cm. et supra auriculas basales 2·5 cm. lata; petiolus glaber, gracilis, supra canaliculatus, basi perdistincte apice parum pulvinatus, 4·5–6 cm. longus. *Racemi masculi* omnino glaberrimi in axillis foliorum nisi 2–3 imorum orti, saepissime compositi, nonnulli apicem caulis versus plane simplices, 4–5 cm. longi, 1–1·5 cm. lati, pedunculis filiformibus vix angulatis nudis 1·5–1·75 cm. longis suffulti; ramuli filiformes, inferiores 1 cm. longi, sursum gradatim abbreviati, bracteis minutis linearilanceolatis 1 mm. longis subditi, saepe 2-flori, nonnunquam 3-flori rarius 1-flori; pedicelli singuli cymosim dispositi, 2 mm. longi bracteolis eos opponentibus bracteis simillimis nisi brevioribus. *Perianthii masculi* urceolati laciniae 2-seriatae, patentes, exteriores ovatae interiores subobovatae, omnes obtusae. *Stamina* 3 aequalia, subsessilia, perianthii laciniis exterioribus opposita; antherae didymae; staminodia nulla. *Spicae foemineae* ignotae.

Japan. Kiu-shiu; Amakusi, mense Aprili florens, *Rein.*

The nearest ally in Japan of the species here described, of which only male examples have so far been seen, is *D. glaberrima*, Miq., which is the only other Japanese *Dioscorea* with but three fertile stamens. The two species further agree in having male inflorescences which may be compound and in having leaves with a finely undulate margin. The differences between *D. asclepiadea* and *D. glaberrima* are, however, very marked. The rigid slender stems in the specimens of *D. asclepiadea* examined by us are erect and stiff below, becoming flexuous only in the upper third and twining only for a short space at the top, the appearance of the plant suggesting that it is a denizen of grassy slopes; *D. glaberrima* is a considerable climber among shrubs. The leaves of *D. asclepiadea* are dull green and thinly membranous with a less conspicuous marginal undulation than in those of *D. glaberrima*, which are shining green above and firmly subcoriaceous. The male flowers of *D. asclepiadea* are distinctly to long pedicelled, those of *D. glaberrima* are sessile, and very considerably larger. Finally the three subsessile fertile stamens of *D. asclepiadea* are not accompanied by staminodes, whereas in *D. gracillima* the three episepaline fertile stamens have well developed filaments, incurved at the top, thrice as long as the anthers and are alternate with three stoutish subclavate epipetaline staminodes

as long as the filaments of the fertile stamens. For an opportunity of studying Dr. Rein's specimens we are indebted to the kindness of Professor Fischer de Waldheim.

886. **Dioscorea Bernoulliana**, *Prain et Burkill* [Dioscoreaceae]; species *D. Dugesii*, Robins., mexicanae et guatemalensi proxima sed omnino glabra et foliis pertenuibus translucentibus ex sicco pallide aeneis caulibus laevibus floribus multo minoribus facillime distinguenda.

Herba omnino glabra; caulis sinistrorsum volubilis, laevis, pallide stramineus. *Folia* ovato-cordata, acute acuminata, sinu basali lato saepius breviore, tenuius membranacea, translucentia et pellucido-venulosa, 7–9-nervia, 8 cm. longa lataque; petiolus gracilis supra canaliculatus, 4 cm. longus. *Flores maris* in racemis axillaribus singulis vel 2–4-nis simplicibus cymulosim dispositi; racemi ad 16 cm. longi; cymulae brevissime pedunculatae, 2–4-florae, inter se 1–3 mm. distantes, basi bracteis lanceolatis 1 mm. longis suffultae; bracteolae flores singulos subsessiles subtendentes bracteis similibus nisi minores. *Perianthium* 6-partitum subcampanulatum, 1·5 mm. latum; segmenta exteriora oblonga, interioribus parum latiora. *Stamina* 6, perianthii segmentis dimidio breviora; filamenta gracilia, basi segmentorum adnata; antherae suborbiculares, introrsae. *Rudimentum ovarii* trigonum, filamentis duplo brevius. *Flores foeminei* ignoti.

Central America. Guatemala: inter Escomillas et Palohueco; Feb. 1878, *Bernoulli & Cario* 847.

Though nearest, among Central American species of the genus *Dioscorea*, to *D. Dugesii*, Robins., the plant described above is hardly referable to the section *Macrogynodium*, as defined by Mr. Uline. It should, perhaps, if we adopt that author's system, be regarded as representing an uncharacterised group, nearly allied to *Macrogynodium*, distinguished from Mr. Uline's section by its very delicate foliage, its smaller made flowers, its less conspicuous rudimentary ovary and the absence of pubescence. In habit and foliage *D. Bernoulliana* most resembles *D. cyanisticta*, J. D. Smith in Coult. Bot. Gaz. vol. xx. p. 10 (1895) a member of the very different section *Brachystigma*, Uline, the species of which have but 3 fertile stamens. For an opportunity of studying Bernoulli & Cario n. 847 we are indebted to the kindness of Professor Fischer de Waldheim, Director of the Imperial Botanic Garden of Peter the Great, Petrograd.

The material on which Professor Robinson in 1894 originally based his *D. Dugesii* (Proc. Amer. Acad. Sci. vol. xxxix. p. 330) was obtained by Dugès in 1880 at Guanajuato, Mexico. Since then it has been found by Heyde & Lux in Guatemala; their specimens have been distributed by Mr. J. Donnell Smith as his n. 6391. In 1896 Mr. Uline published a description of *D. violacea* (Engl. Bot. Jahrb. vol. xxii. p. 423) citing under this species Pringle n. 1774 from Oaxaca, Mexico, issued as "*D. composita*, Hemsl.." and in addition Galeotti n. 5461 δ, from Xalapa, Mexico. Some error has crept into the citation

from Mr. Pringle's lists; Pringle n. 1774 is a *Rhus* while the specimens of *D. composita*, Pringle non Hemsl., were issued as Pringle n. 4774. A similar error may have arisen with regard to Galeotti n. 5461 ♂; in the Kew collection this gathering, as was pointed out by Dr. Hemsley in 1885 (Biol. Centr. Amer. Bot. vol. iii. p. 358) is referable to *D. macrostachya*, Benth. The plant issued by Pringle under n. 4774 as *D. composita* is *D. Dugesii*, Robins., so that *D. violacea*, Uline, in so far as that species is based on Pringle's specimens, must be treated as a synonym of *D. Dugesii*. Whether Galeotti n. 5461 ♂ may elsewhere than at Kew include material of a species other than *D. macrostachya*, Benth., is a point to which attention may have to be given. In connection with Mr. Bentham's species it should, when so doing, be noted that Mr. Uline has cited under *D. macrostachya*, Benth. (Pl. Hartweg. p. 73) a specimen of Bourgeau n. 1488, collected at Cordova, Mexico, on 17 December, 1865. The specimen of Bourgeau n. 1488 in the Kew collection exhibits no character that invalidates Mr. Uline's suggestion, though that author has not noted that the specimen in question forms the basis of *D. propinqua*, Hemsl. (Biol. Centr. Amer. Bot. vol. iii. p. 359) and that, if his judgment be justified, this name should be regarded as an additional synonym of *D. macrostachya*, Benth.

887. **Dioscorea Carionis,** *Prain et Burkill* [Dioscoreaceae]; species *D. densiflorae*, Hemsl., et *D. albicauli*, Uline proxima; ab illa bracteis 2–3-plo brevioribus ab hac floribus maris pedicellatis apte distinguenda.

Herba plus minusve puberula; caulis sinistrorsum volubilis, siccitate brunnescens. *Folia* ovato-cordata vel subcordata, acute acuminata, membranacea, 7–9-nervia, nervis externis simpliciter furcatis, 7·5 cm. longa, 5·5 cm. lata, subtus secus nervos puberula; petiolus supra canaliculatus, 3·5 cm. longus, puberulus. *Flores maris* in racemis axillaribus solitariis simplicibus usque ad 20 cm. longis dispositi; singuli inter se 3–7 mm. distantes pedicellis puberulis 2 mm. longis suffulti; bracteae ovato-lanceolatae, 3 mm. longae; bracteolae bracteis similes, 2 mm. longae. *Perianthium* 6-sectum, subrotatum, 5 mm. latum; segmenta ovato-lanceolata, acuta, 3–4 mm. longa, subaequalia. *Stamina* 3 episepalina, segmentis duplo breviora; filamenta crassiuscula, sursum abruptius recurvata; antherae suborbiculares, extrorsae; staminodia epipetalina 3 subclavata, filamentis sesquilongiora fertilibusque fauci tubi perianthii inserta. *Flores foemenei* ignoti.

Central America. Guatemala: S. Martin Zaratepequez; Feb. 1878, *Bernoulli & Cario* 848.

The species here described, for an opportunity of studying which we are indebted to the courtesy of Professor Fischer de Waldheim, Petrograd, is a member of the section *Oxypetalum*, Uline, agreeing with *D. densiflora* Hemsl. (Biol. Centr. Amer. vol. iii., p. 356) as regards its perianth and its pedicels, and with *D. albicaulis*, Uline (Engl. Bot. Jahrb. vol. xxii. p. 425) as

regards its bracts and bracteoles. The type of *D. albicaulis*, described in 1896, is a Guatemala plant collected by Heyde & Lux at Cerro Gordo, Santa Rosa, issued by Mr. J. Donnell Smith as n. 3869. This plant has leaves which are pubescent on the nerves beneath, not glabrous as stated in the original diagnosis, where it is inadvertently cited as n. 3569.

888. **Dioscorea melastomatifolia,** *Uline* MSS. *ex Harms in Herb. Kew* [Dioscoreaceae]; species *D. truncatae*, Miq., simillima sed antheris altius insertis, foliis margine vix hyalinis, caulibus sinistrorsum volubilibus apte distinguenda.

Frutex omnino glaber; caulis sinistrorsum volubilis, brunnescens. *Folia* ovata summo apice apiculata, basi late cuneata vel subrotundata, membranacea, laete viridia, utrinque secus nervos venosque colorata, 3-nervia nervo intramarginale incompleto pergracile addito, 5–8 cm. longa, 1·75–4·25 cm. lata; petiolus supra canaliculatus, 0·5–1 cm. longus. *Flores* spicati, in utroque sexu pro bractea singuli. *Spicae maris* 4–5 cm. longae in paniculas axillares semel ramosas saepius 7–8 cm. longas dispositae; inferiores foliis quam caulina minoribus, superiores bracteis lanceolatis 1–1·5 cm. longis suffultae, plurifloraе; rhachis angulata brunnescens; flores inter se 2–3 mm. remoti; bracteae ovatae, acutae, 1 mm. longae, nonnunquam bracteolis 1–2 bracteis similibus nisi minoribus additis. *Perianthium* 6–partitum, campanulatum, maculis perpaucis rubris notatum; lobi ovati, obtusi, subaequales. *Stamina* 6; antherae fere sessiles, globosae, ad basin loborum 1–seriatim insertae. *Ovarii rudimentum* 0. *Spicae foemineae* simplices, axillares, 10–16 cm. longae plurifloraе; rhachis angulata; flores inter se 1–3 cm. remoti; bracteae iis maris conformes bracteolis saepius 2 additis. *Capsula* reflexa, obovato-oblonga, apice retusa, 3·5 cm. longa, 2·5 cm. lata. *Semina* anguste oblonga, circumcirca alata; ala in lateribus quam supra et infra angustior.

South America. Brazil; Graõ Para; Santarem, *Spruce* 787*.

This *Dioscorea* was collected by the late Dr. Spruce in the neighbourhood of Santarem in April, 1850; his manuscript field-note reads:—'Campo. Fruit oblong-obcordate, shining, with three *broad* wings. Leaves oval, apiculate.' The name used for the species is given on the authority of Dr. Harms; the description here published has been prepared owing to the necessity there is for discrimination between this plant and *D. truncata*, Miq., based on specimens collected by Richard Schomburgk at Berbice in British Guiana, which Dr. Harms has treated as conspecific with the plant collected by Spruce at Santarem. In Mr. Uline's system *D. melastomatifolia* is best placed in the section *Apodostemon*, and in that portion of the section, as defined by him, wherein the plane of insertion of the stamens is circular.

889. **Dioscorea truncata,** *Miq. ex R. Schomburgk in Versuch Faun. & Flor. Brit. Guian.* p. 899—nomen tantum [Dioscoreaceae]; species *D. marginatae*, Griseb. et *D. melastomatifoliae*, Uline, brasiliensibus proxima, ab illa floribus utriusque

sexus minoribus maris singulis petiolisque brevioribus, ab hac foliis margine hyalinis antheris intra tubum corollae insertis caulibus dextrorsum volubilibus distinguenda.

Frutex omnino glaber; caulis dextrorsum volubilis, brunnescens. *Folia* ovata, acuta summo apice apiculata, basi late cuneata vel subrotundata imo basi subito contracta et in petiolum anguste decurrentia, margine hyalina, papyracea, supra intense viridia subtus pallidiora et minute nigro-punctata, inferiora 5–nervia, superiora 3–nervia nonnunquam praesertim in foliis caulinis nervo intramarginale incompleto pergracili addito, 4–8 cm. longa, 2–3·5 cm. lata; petiolus supra canaliculatus, dimidio superiore anguste alatus, 1–1·5 cm. longus. *Flores* spicati in utroque sexu pro bractea singuli. *Spicae maris* in paniculam amplam terminalem iterum ramosam dispositae; rami primarii 8–16 cm. longi, inferiores foliis quam caulina parum minoribus superiores bracteis vel foliis valde redactis 2–5 mm. tantum longis suffulti; ramii secundarii (spicae propriae), 4–10 cm. longi pluriflori; rhachis angulata maculis rubris crebre notata; flores inter se 2–4 mm. remoti; bracteae ovato-acuminatae, 1 mm. longae, rubro-maculatae nonnunquam bracteolis 1–2 bracteis similibus nisi multo minoribus additis. *Perianthium* 6-partitum, campanulato-rotatum, ob maculos crebros rubro-brunneum; lobi suborbiculares, exteriores interioribus parum majores. *Stamina* 6; antherae fere sessiles, globosae, prope basin tubi circa ovarii rudimentum 3-lobum sub-2-seriatim insertae. *Spicae foemineae* simplices, versus caulis apicem axillares, 10–18 cm. longae, plurifloraе; rhachis valde angulata, maculis rubris crebre notata; flores inter se 1–8 mm. remoti; bracteae iis maris conformes bracteolis saepius 2 additis. *Perianthium* 6-partitum campanulato-rotatum, ·8 mm. latum, rubro-brunneum; lobi suborbiculares, subaequales. *Stamina* 6; antherae imperfectae, minutae, sessiles, prope basin tubi circa stylum sub-2-seriatim insertae. *Ovarium* 5 mm. longum, viride, rubro-notatum; stylus perbrevis; stigma 3-lobum, lobis ovatis integris recurvo-explanatis. *Capsula* reflexa, obovato-oblonga, apice subtruncata, 3 cm. longa, 2–2·25 cm. lata. *Semina* circumcirca alata.—*D. parvifolia*, Sagot MSS. in Herb. Kew, non Philippi. *D. parviflora*, Benth. Mus. in Herb. Kew, non Philippi. *D. melastomatifolia*, Harms MSS. in Herb. Kew partim, non Uline.

South America. British Guiana; Berbice, *Richd. Schomburgk* 224; Berbice River, *Jenman* 1701. French Guiana; Karouany, *Sagot* 860.

The *Dioscorea* described above is a member of the section *Apodostemon*, Uline, and is referable to the subsection, recognised by Mr. Uline, in which the plane of insertion of the stamens is trigonous in outline. The species was first met with in 1837 by Dr. Richard Schomburgk, at Berbice, and was distributed, without name, as his n. 224. From Schomburgk's *Versuch einer Fauna und Flora von Britisch-Guiana*, published in 1848, we find that in the interval Professor Miquel had recognised in this Berbice *Dioscorea* an undescribed species, which he named *D. truncata*, evidently with reference to the shape of the ripe

capsule. Unfortunately Dr. Kunth, who examined most, and was responsible for the naming of some of Schomburgk's Guiana Dioscoreas, has neither taken up Miquel's name nor referred to Schomburgk's specimens, in the account of this genus published in 1850 in his *Enumeratio Plantarum*, vol. v., with the result that the name duly proposed for the plant has been overlooked, and that until now it has never been formally described. Schomburgk n. 224 is in female flower and fruit only, and bears the field-note "twiner, flowers reddish-brown."

The species was met with again at Karouany in French Guiana in 1855, 1856 and 1857, by Mr. P. Sagot, the specimens of 1855 being male, those of 1856 and 1857 being female. All were issued as Herb. Sagot, n. 860, most of the specimens as an unnamed *Dioscorea*, though one female specimen at Kew has been written as *D. parvifolia*, Sagot, by Mr. Sagot himself, while one male specimen has been written up by the late Mr. Bentham as *D. parviflora*, a more appropriate name. These names indicate that both Sagot and Bentham shared the view of Miquel; both names have been used since by Philippi for two species from Chile. In 1882 the species was collected once more by Mr. Jenman on the Berbice River, his specimen, Jenman n. 1701, being compared in Herb. Kew, by Professor Oliver, with the Brazilian *D. marginata*, Gris. More recently, Schomburgk n. 224, the original basis of *D. truncata*, Miq., has been identified by Dr. Harms with *D. melastomatifolia*, Uline, a Brazilian species collected by Dr. Spruce at Santarem, in male flower and in ripe fruit, in April, 1850, the specimens of which have been distributed as Spruce n. 787*. The resemblance between Schomburgk n. 224 and Spruce n. 787* is very striking, whether as regards the size and shape of the leaves, the size and disposition of the male flowers, or the size and shape of the ripe fruit and the seeds. At the same time the differences between the two are just as marked. The male flower in *D. melastomatofolia* is campanulate, not rotate-campanulate; the sessile anthers are inserted at the top of the tube, not near its base, while the plane of their insertion is circular in place of trigonous. Finally the stem in *D. melastomatifolia*, Uline, twines to the left instead of to the right as in *D. truncata*. The note by Professor Oliver on Jenman n. 1701, above alluded to, reflects much more closely the natural affinity of *D. truncata*. Grisebach's *D. marginata*, as exemplified by *Smilax spicata*, Vell. Fl. Flum. t. 112 (not Vell. l.c. t. 111 which represents a true *Smilax*) and by specimens belonging to the species figured by Velloso, collected in both sexes by Saltzmann at Bahia, agrees as regards the structure both of its male and female flowers with *D. truncata*, Miq. The two seem, however, specifically distinct. The hyaline margin of the leaf of *D. marginata* is much stronger, the petiole is considerably longer, the male corolla is twice as large, and the male flowers are clustered in place of solitary. Neither Velloso's figure nor Saltzmann's specimens admit of a definite statement as to the direction in which the stem of *D. marginata* twines, but Saltzmann's material does show that the torsion of the stem itself is to the left not to the right.

890. **Philodendron** (**Baursia**) **teretipes,** *Sprague* [Araceae—Philodendreae]; affine *P. Glaziovii*, Hook. f., a quo petiolis teretibus, inflorescentia minore subsessile, ovulis paucioribus distinguitur.

Caulis sub inflorescentia circiter 1–3 cm. diametro. *Folia* longipetiolata; petioli erecto-ascendentes, apice recurvati, teretes, 11–16 cm. longi, medio 6–7 mm diametro, flavidi, apicem versus rubro-tincti; petiolus folii supremi basi 1·3 cm. vaginans; laminae deflexae, lanceolatae, breviter acute acuminatae, in basin subdeltoideo-angustatae, 14·5–21·5 cm. longae, 3·8–6·2 cm. latae, marginibus leviter recurvatis rubris, basi supra petiolum anguste connatis; nervi primarii utrinsecus circiter 12, quam intermedii vix conspicuiores. *Pedunculus* communis nullus; spatha inferne ad pedunculum spadicis adnata, 11 cm. longa, cremea, intus coccinea, apice cuspidata, parte expansa obovata 6·5 cm. longa, 3·2 cm. lata; pedunculus spadicis 1·5 cm. longus, per totam longitudinem ad basin spathae adnatus; spadix 8·5 cm. longus, parte feminea 2 cm. longa. *Pistilla* 1·6–1·8 mm. longa, stigmate discoideo 1·2 mm. diametro; ovarium 7–loculare, loculis paullum ultra medium productis; ovula pro loculo 2–3, e basi erecta.

Tropical America. Described from a fresh specimen of a plant grown in the Royal Botanic Gardens, Glasnevin, where it was received from Mr. O'Brien in July, 1912, with the statement that it had been imported with *Zygopetalum Sanderianum*, Regel.

XXXVI.—THE AFRICAN SPECIES OF GOUANIA.

M. L. Green.

The genus *Gouania* (*Rhamnaceae*) is very widely distributed in the tropics. Its salient characteristics are the watch-spring tendrils, spike-like thyrses, a more or less lobed disc, inferior ovary and longitudinally 3-winged septicidal fruits. The fruits are crowned by the persistent receptacular cup, and their wings are formed by the united margins of adjacent carpels. When mature the fruit separates into its component carpels, and it then consists of the three mericarps suspended from and held together by the three pairs of strands into which the central columella has split up.* The strands arise in pairs at the angles of the columella, run up along the median lines of the carpels which project as narrow ridges, curve sideways a little below the apex towards the top of the wings and pass over them to their outer side where they form a raised network. This network ultimately separates from its mericarp owing to the decay of the subjacent parenchyma, but retains the mericarp loosely for a time until it is blown away by the wind or falls out.

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* At this stage the fruit recalls that of *Heracleum Sphondylium*, Linn., except that the latter has only two mericarps, each borne on a single strand.

The fruit and its dehiscence were well described by Gaertner* as long ago as 1791 in the following words:—

"*Capsulae* tres, ope corticis communis in fructum triquetrum, rotunde trialatum ac trifariam dehiscentem coadunatae. Cortex tenuis, ex epidermide fugaci et reticulo fibroso capsularum dorso incumbenti compositus. Capsulae partiales crustaceae, duriusculae, ad utrumque suum marginem in alam rotundatam, suberosam et sebi adinstar fragilem ampliatae, hinc depressiusculae, albae, inde angulatae et ferrugineo-sphacelatae, unilaculares, evalves. *Receptaculum commune* in axi fructus positum, sexfidum, filiforme; filis per paria junctis, secundum angulum ventralem capsularum adscendentibus, deinde vero in earundem dorsum reflexis atque fibrosum rete formantibus, cujus ope capsulae in situ pendulo post dehiscentiam fructus sustinentur; *proprium* nullum, praeter cicatriculam in fundo loculamentorum, cui semina affixa sunt."

In the Flora of Tropical Africa vol. i. p. 383 (1868) only one species, *Gouania longipetala*, Hemsl., was recorded from Tropical Africa. The description of the flower was drawn up from specimens collected by Mann in Fernando Po and at the river Kongui, Spanish Guinea, whilst the fruit was described from a specimen collected by Kirk in Portuguese East Africa. Since 1868, however, ample fruiting material has arrived of the West African plant, and it is now evident that Kirk's specimen represents a new species, which is described below as *G. mozambicensis*. It differs from *G. longipetala* in the laxer infructescence with distinct lateral branches and the much larger fruits.

Three other species have been recorded from Tropical Africa, *G. longispicata*, Engl., *G. pannigera*, Tul. and *G. Sereti*, De Wild.

G. longispicata was described by Engler in Pflanzenw. Ost.-Afr. C. p. 256 (1895) and is widely distributed in Tropical East Africa. In the same work Engler recorded *G. pannigera* from the Zambesi Region; this species is a native of Madagascar, and was not previously known to occur in Africa. Confirmation of its occurrence there is desirable. *G. Sereti* was described by De Wildeman in Ann. Mus. Congo, Sér. V. ii. p. 45 (1907) and appears to be confined to the Belgian Congo. The differential characters of the five species may be summarised thus:—

1. **G. longipetala,** *Hemsl.*—*Ramuli* puberuli. *Petioli* 0·8–1 cm. longi. *Folia* subtiliter (rarius manifeste) crenulata, subtus secus nervos pilosa; nervi laterales 3–4. *Pedicelli* circiter 2 mm. longi. *Calyx* extra sparse hirsutus. *Petala* calycis lobis longiora. *Discus* in lobos haud productus. *Mericarpia* glabra, 9 mm. longa, 1·1 cm. lata.

2. **G. longispicata,** *Engl.*—*Ramuli* juniores ferrugineo-tomentosi, vetustiores glabri. *Petioli* 1–4 cm. longi. *Folia* acute serrulata, subtus dense tomentosa; nervi laterales 5-7. *Pedicelli* 4–5 mm. longi. *Calyx* extra tomentosus. *Petala* calycis lobis

* Gaertner, De Fructibus et Seminibus Plantarum, ii. p. 187 t. 120, fig. 4 (1791).

aequilonga. *Disci* lobi transverse oblongi, breviter retusi vel subtruncati, 0·25 mm. longi, 0·5 mm. lati. *Mericarpia* leviter hirsuta, 8 mm. longa, 9·5 mm. lata.

3. **G. pannigera,** *Tul.*—*Ramuli* ferrugineo-tomentosi. *Petioli* 1·1–1·3 cm. longi, pariter induti. *Folia* integra sed interdum margine crispatulo, apice rotundata, supra pubescentia, subtus tomentosa, nervis ferrugineis exceptis albido-fulva; nervi laterales 5–6. *Pedicelli* circiter 1 mm. longi. *Calyx* extra tomentosus. Petala calycis lobis aequilonga. *Disci* lobi transverse oblongi vel subtruncati, 0·3 mm. longi, 0·5 mm. lati. *Mericarpia* dense hirsuta, circiter 8 mm. longa, 7 mm. lata.

4. **G. mozambicensis,** *M. L. Green.*—*Ramuli* juniores pilosuli, vetustiores glabri. *Petioli* 2–4 cm. longi. *Folia* inconspicue crenata vel subintegra, subtus secus nervos subappresse pilosa; nervi laterales 7–8. *Pedicelli* circiter 3 mm. longi. *Mericarpia* glabra, 1·5–1·7 cm. longa, 1·5–1·8 cm. lata.

5. **G. Sereti,** *De Wild.*—*Ramuli* breviter pilosi. *Petioli* 0·6–1·2 cm. longi, griseo-tomentosi. *Folia* crenulato-dentata, subtus albo-velutina. *Pedicelli* 3–5 mm. longi, tomentosi. *Calyx* extra sparse pilosus, lobis 1·5 mm. longis. *Petala* calycis lobos haud superantia. *Disci* lobi profunde bilobulati. *Mericarpia* ignota.

Their synonomy and geographical distribution are as follows:—

1. **G. longipetala,** *Hemsl.* in Oliv. Fl. Trop. Afr. i. p. 383 (1868), specimine fructifero excluso.

Distrib. French Guinea: Kouria, *Chevalier* 14969. Sierra Leone: Scarcies; near Kukuna, *Scott Elliot* 4741. Liberia: Kaka town, *Whyte.* Gold Coast: Ashanti; W. of Obuari, Aininam, *Chipp* 582. Larte Hills, *Johnson* 812. Ashanti, *Cummins* 14. S. Nigeria: Oban, *Talbot* 1361; *Dennett* 23. Cameroons: Yaúnde, *Zenker & Staudt* 586; near Efulen, *Bates* 443; Bipinde, *Zenker* 1134, 3458. Fernando Po: *Mann* 17. Spanish Guinea: River Kongui; *Mann* 1813. Angola: *Monteiro.*

2. **G. longispicata,** *Engl.* Pflanzenw. Ost.-Afr. C. 256 (1895); Engl. in Mildbr. Wiss. Ergebn. Deutsch. Zentr.-Afr.-Exped. 1907–1908, ii. 490 (1912).

Distrib. British East Africa: Battiscombe 297; descending the Mau Plateau towards Nandi, *Whyte.* Nyasaland: Masuku Plateau, *Whyte;* Mt. Chiradzulu, *Whyte.* Rhodesia: Chirinda Forest, *Swynnerton* 96.

3. **G. pannigera,** *Tul.* in Ann. Sc. Nat. Sér. IV. viii. 134 (1857); Engl. Pflanzenw. Ost.-Afr. C. 256 (1895).

Distrib. Central and North West Madagascar; Portuguese East Africa: Gorungosa, (fide *Engler* l.c.).

4. **G. mozambicensis,** *M. L. Green;* species nova, *G. longipetalae,* Hemsl., et *G. longispicatae,* Engl., affinis, sed infructescentia laxiore fructu multo majore differt.

Frutex scandens (*Kirk*). *Ramuli* leviter costati, juniores pilosuli, vetustiores glabri. *Folia* ovata, apice breviter acuminata, basi cordata vel subtruncata, 5–7 cm. longa, 3·5–4·5 cm. lata, inconspicue crenata vel subintegra, chartacea, supra glabra, subtus secus nervos subappresse pilosa; petioli 2–4 cm. longi, pubescentes. *Thyrsi* laxi, fructiferi 4–11 cm. longi, rhachi plus minusve pubescente; pedunculi 5–6 mm. longi; pedicelli 2·3 mm. longi. *Flores* non visi. *Mericarpia* suborbicularia, 1·5–1·7 cm. longa, 1·5–1·8 cm. lata, manifeste reticulata, glabra, sinu basali 1 mm. longo, apicali 1–1·5 mm. longo. *Semina* 5 mm. longa, 3·5–4 mm. lata, nitida, glabra, endospermio corneo.—*G. longipetala*, Hemsl. in Oliv. Fl. Trop. Afr. i. p. 383 (1868), quoad fructum.

Distrib. Portuguese East Africa: Shupanga, *Kirk* (1860).

5. **G. Sereti,** *De Wild.* in Ann. Mus. Congo, Sér. V. ii. 45 (1907).

Distrib. Belgian Congo: on the borders of the forest between Niangara and Gumbari, *Seret* 448.

XXXVII.—A NEW EUPHORBIA FROM ST. HELENA.

A. Thellung and O. Stapf.

In the Report on the Botany of the Atlantic Islands Hemsley enumerated a doubtful *Euphorbia Chamaesyce* which since Burchell's day had repeatedly been collected in St. Helena where it was known as "French Grass." He says of it "We have been unable to match this, but in a genus like Euphorbia we shrink from founding a new species upon what may be only a slightly altered state of some well-known one, or even exactly the same as a described species. Roxburgh treated it as an introduced plant, and named it *Euphorbia rosea*, which it is not. Burchell who did not distinguish between the native and introduced plants, collected it in Sandy Bay; Melliss expressed his opinion that it is probably indigenous." Recently Dr. Thellung, of Zurich, had an opportunity of examining some fragments of the St. Helena plant and by his studies of alien plants and weeds having made himself familiar with the members of the *Chamaesyceae* group of *Euphorbia*, came to the conclusion that it represented indeed, as Hemsley suggested, a new species. Subsequently he applied to me for the examination of the fairly ample material preserved in the Kew collections and the completion of the description which he had drawn up from the samples at his disposal, the result being the confirmation of his view of the plant as an undescribed member of the *Chamaesyceae* group and the description of it given below.

Although extremely similar in general appearance to several species of the *Chamaesyceae* the structure of the involucre is quite distinct. It is distinctly 5-merous, whilst it is stated to be 4-merous in all the other species of the group. There are 5 fimbriate broad-linear segments and alternating with them 5 linear somewhat narrower and shorter segments. Of these

4 (sometimes only 3) bear at their apex a roundish yellow gland, slightly impressed in the centre, the fifth (or fourth or fifth) being produced into two horns, very like the fimbriae with or without a rudimentary gland at their base. The species does not seem to have been found so far in any other part of the world and must therefore for the present be regarded as endemic in St. Helena.

Euphorbia (§**Anisophyllum**) **heleniana,** *Thellung et Stapf* [Euphorbiaceae-Euphorbieae]; habitu simillima E. *Chamaesycae*, L., *E. humifusae*, Willd., *E. inaequilaterae*, Sond., *E. serpyllifoliae*, Pers., sed ab omnibus hisce speciebus involucro 5-mero fimbriato-lobato distincta. Caeterum differt ab *E. Chamaesyce*, cuius formis a W. B. Hemsley dubitanter adnumerata erat, foliis serrulatis, glabritie omnium partium, glandulis minimis rotundatis exappendiculatis, seminibus levissime tantum rugulosis, ab *E. humifusa* foliis crassiusculis, seminibus haud levissimis, ab *E. inaequilatera* seminibus multo levius rugulosis, ab *E. serpyllifolia* quacum seminum structura bene convenit, foliis crassiusculis. *E. ovalifolia* Engelm., involucri lobis fimbriatis quidem gaudens, differt foliis tenuibus integerrimis.

Herba annua, glaberrima, radice tenui. *Caules* prostrati, 5–6 cm., raro ad 12 cm. longi, filiformes, cylindrici, saepe purpurascentes, dichotome ramosi. *Folia* opposita, crassiuscula, saepe purpureo-tincta, lati elliptico- vel oblongo-obovata, basi plerumque inaequalia, latere altero rotundato vel subcordato, altero attenuato, a medio vel saltem apicem versus subtiliter sed distincte mucronulato-serrulata, apice obtusa, 3–5 mm. longa, 1·5–3 mm. lata. *Stipulae* membranaceae, in lacinias filiformes fissae. *Cyathia* versus apices ramorum in dichotomiis solitaria, breviter (circiter $\frac{2}{3}$–$\frac{3}{4}$ mm.) pedunculata, campanulato-turbinata, circiter 1 mm. longa, fauce nuda, lobis elongatis fimbriatis, fimbriis plerumque 3 (rarius ad 5) e cellulis 2- vel pluri-seriatis constantibus; glandulae rotundatae, centro vix impressae, minimae, stipitatae **stipite applanato, appendicibus** nullis. *Flores* ♂ circiter 4. *Capsula* circiter 1·5–2 mm. longa, 1·5 mm. diametro, coccis dorso carinatis; styli breves, breviter 2-fidi. *Semina* oblongo-ovoidea, tetragona, paulo ultra 1 mm. longa, $\frac{2}{3}$ mm. lata, aurantiaca vel pallide fusca, faciebus fere laevibus, medio tantum rugulis transversis perpaucis levissimis undulatis.—*E. rosea*, Roxb. in Beatson's St. Helena Tracts, p. 308; Melliss, St. Helena, p. 319, non Retz. *E. Chamaesyce*, (var. vel species nova?), Hemsley, Bot. Challenger Exp. vol. i. p. 82, non Linn. *E. prostrata* Burch. exs. No. 110 ex Hemsley, l.c., non Ciet.

St. Helena. Potato Bay, 1809, *Burchell* 110; lower barren rocky parts, 1867, *Melliss;* without precise locality, *Haughton; Whitehead.*

XXXVIII.—MINOR AGRICULTURAL INDUSTRIES: IV.

Culinary Herbs.

W. Dallimore.

A good deal of attention has been paid during the last few months to the cultivation of medicinal herbs, but little notice has been taken of the cultivation of flavouring or culinary herbs although it is an industry of some importance amongst cottagers and small farmers in the neighbourhood of certain large towns. In south-west Lancashire such herbs are very popular under the name of pot-herbs and they find a ready sale in Liverpool, Bolton, Manchester, Bury and many other places.

During the autumn of 1915 an opportunity occurred of visiting a number of farms and cottage gardens in the Lancashire villages of Maghull, Lydiate, Aughton, Scarisbrick and Narrow Moss, where pot-herbs are well grown, and the following notes are based largely upon information gleaned during that visit.

The work appears to be confined to small farms and cottage gardens, farmers with large holdings rarely troubling about the business. In some instances cottagers specialise on the work, whilst in other cases a few beds of herbs are included amongst other market crops. Very often the work of cultivation and preparation for market is left almost entirely in the hands of women, the wives of farm servants accepting it as part of their home work. In other cases the cultivation of pot-herbs is included in the routine of the ordinary work on small farms, but even then much of the work is left to women.

The herbs most in demand are thyme, sage, marjoram, mint, and parsley. The soil in that neighbourhood is generally light and it is usually heavily manured for potatoes or some other crop before being planted with herbs. As a rule the herbs are planted in beds about 4 ft. wide, for convenience of handling, although wide breadths are sometimes seen.

Thyme is very popular and two kinds are grown, one of annual duration, the other perennial, and they are known respectively as "annual" thyme and "stock" thyme. Seeds of the former are sown out-of-doors in spring and gathering commences as soon as the plants show signs of flowering. The plants are cut over close to the ground or pulled up by the roots and tied in small bundles, a bundle being as much as can be conveniently grasped in one hand. The stock thyme is increased each spring by division. Small plants are put out in March which, by the end of summer, are a foot or more across. Gathering begins as soon as the annual kind is over. The plants are cut down to the ground and the roots are afterwards ploughed up, the necessary number of plants for division for the following year's crop being retained. Both thymes were identified at Kew as forms of *Thymus vulgaris*, L.

Sage of two kinds is also grown under the names of "annual" and "stock" sage. The first-named is grown from seeds sown

in spring, the other from layered branches or sometimes from cuttings. Annual sage is collected when fully grown but before the flowers open if possible, and the stock sage is reserved for later use. As in the case of thyme the best results are obtained from young plants. Both sages are forms of *Salvia officinalis*, L. In one or two cases a purplish-leaved form of sage was noted but it was not general.

Marjoram or "Sweet Marjoram" (*Origanum Marjorana*, L.) is grown from seeds sown broadcast in beds in May. The crop is collected towards the end of summer just as the plants are coming into flower. It is almost as popular as thyme for flavouring purposes and large quantities are grown. When collected it is tied in bunches like thyme and sold wholesale at from 5d. to 9d. a dozen bunches.

Mint (*Mentha viridis*, L.) is not grown by so many people as the other herbs, but is usually in larger areas. The shoots are collected from early spring to late summer and some people lift plants and place them in frames in late autumn so as to advance growth during early spring. Plantations are not allowed to stand long on the ground, better results being procured from young stock. When forming plantations rooted shoots are dibbled into well-worked land during moist weather in spring.

Parsley is usually sown broadcast in beds, sometimes alone but often with onions, the onions being pulled early and the parsley left to form the main crop. Formerly other herbs were cultivated, such as pennyroyal, horehound, tansy, chamomile and wormwood, but it is said that there is very little call for them now, and they are not grown in quantity in the district in question.

Marketing is almost entirely by the bunching method, a bunch being as much as can be conveniently grasped in one hand and the growers usually sell wholesale, sometimes to buyers who visit the gardens, but more often in the open market. Much of the produce is sent to market by road, cottagers usually arranging to send small quantities on neighbouring farmers' carts, the farmer or his agent acting as seller. Prices vary from time to time. Last September, thyme, sage and marjoram were selling wholesale at from 5d. to 9d. a dozen bunches, whilst in the retail market at Liverpool from 1d. to 1½d. per bunch was asked. Some growers have erected drying sheds and when prices for green herbs are low, they dry their produce and store it until better prices can be obtained. Other growers supply regular customers, and one man informed me that he supplied a considerable quantity of dried herbs to certain shipping companies.

Although the business is not one for indefinite extension it is well worth the attention of small holders in the vicinity of large towns, for, apart from the actual preparation of the ground the work is not difficult and can be conducted by women and children. Whether it would pay to cultivate any of these subjects, or others such as lavender and peppermint for the distillation of

oil would be a matter for experiment in particular districts, but for such work it would appear that success could only be expected by a proper system of co-operation amongst the growers.

During my visit I was greatly impressed by the general good cultivation of the crops, which was particularly noticeable on a number of small holdings, each about one Cheshire acre (a little more than two English acres) in extent, at Narrow Moss, and on a farm near by. These small holdings were excellently cropped and very clean. The tenant of one told me that his was worked entirely by the spade and his only assistant was an elderly female relative. The greater part of the land was given over to thyme, sage and marjoram, and his produce was marketed in several towns mostly to regular customers. In the other case a portion of a farm was given over to herb and flower cultivation. The preparation of the land was done as far as possible by horse labour, the remainder of the work being carried out by one of the farmer's daughters, assisted by her father, a man over 70 years of age. The land was excellently worked and very clean. Although entirely self trained this lady had evidently solved the problem of the cultivation of every plant she had taken in hand. Some idea of her work may be gleaned from the fact that she sends the flowers of an annual *Gypsophila* to market by the wagon-load.

XXXIX.—MISCELLANEOUS NOTES.

Baobab trees used for storage of water.—In *Kew Bulletin*, 1910, p. 98, an extract was given from an article in the *Geographical Journal* on the storage of water in the hollow trunks of Baobab trees (*Adansonia digitata*) in the Sudan. We have recently received the following account of these trees from an officer in the Darfur Campaign:—

"On our side of the border in Kordofan they have no wells for perhaps hundreds of miles, and live in the dry season on water stored in hollow trees, called tebeldis. They are ugly bottle-shaped trees, all trunk, from 6 ft. to 20 ft. thick, and a good one holds 1000 gallons. Each family owns certain trees and each tree has its own name. They scrape a small pond at the foot, and after a shower everyone turns out to fill tebeldi trees. A man stands at the top of the bole about 20 ft. up, hauls the water up in a skin bucket and pours it into the tree. It keeps very sweet and is better than well water. Ali Din Nar frightened our people by promising to send across and cut the tebeldis; if he had done it, the country would have become uninhabitable. No one has ever seen a young tebeldi, and no one knows how old the custom is, but most of Kordofan must have been uninhabited, except by nomads in the rains, until someone thought of filling the trees."

Another account of the use of the trees for storing water is given by Major C. Percival in his paper on Tropical Africa in the *Geographical Journal*,* and is as follows:—

"Two further instances of ancient customs have come under my notice, and are worth relating here. In the fourteenth century, when the African historian, Ibn Batuta, made his journey across the desert from Morocco to the Niger, he relates how 'water was stored in trees by the people'; this custom is still common in Kordofan to this day. The tree is the Banian† or Tebeldi tree (*Adansonia digitata*); it is hollowed out when necessary, and is in some cases mended with bricks and cement. The trees are filled up by the Arabs during the rains, and are a source of income to their owners through the sale of the water to travellers. The same traveller, Ibn Batuta, mentions the keeping of bees in hollow trees for the sake of the honey. This is a common practice in the Sudan, where hollow trunks, stopped with mud, are placed in trees by the natives with a view to attracting the bees for the sake of their honey."

Ibn Batuta was born about the year 1303 A.D., and died about the year 1377. The date of the publication of his travels is some time between 1349 and 1377. The following extract is the passage to which Major Percival refers in his article:—

"I then proceeded from Abu Latin to Mali, the distance of which is a journey of four-and-twenty days, made with effort. The roads are safe, so I hired a guide and proceeded with three of my companions. These roads abound with trees, which are high, and so large that a caravan may shade itself under one of them. As I passed by one of these trees, I saw a weaver weaving cloth within a cleft of its trunk. Some of these will grow so corrupt that the trunk will become like a well and be filled with the rain-water, and from this the people will drink. Sometimes the bees will be in these in such numbers that they will be filled with honey, which travellers take for their use."‡

Botanical Magazine for July, August and September.—The plants figured are *Paeonia Willmottiae*, Stapf (t. 8667), from China; *Cirrhopetalum concinnum*, Hook. f., **var.** *purpurea*, Ridl. (t. 8668), from the Malay Peninsula; *Rhododendron Hanceanum*, Hemsl. (t. 8669), from Szechuan; *Brachystelma oianthum*, Schlechter (t. 8670), from South Africa; *Pandanus furcatus*, Roxb. (t. 8671), from India; *Viburnum betulifolium*, Batalin (t. 8672), a native of Central China; *Euphorbia Caput-Medusae*, Linn. (t. 8673), from South Africa; *Mesembryanthemum transvaalense*, Rolfe (t. 8674 A.) and *M. tuberculosum*, Rolfe (t. 8674 B.), both natives of South Africa; *Rhododendron monosematum*, Hutchinson (t. 8675), from Western China; *Ursinia cakilefolia*, DC. (t. 8676), a native of South-West Africa. *Lonicera tatarica*, Linn. (t. 8677), ranging from

* Tropical Africa, on the Border Line of Mohamedan Civilisation, in *Geographical Journal*, vol. 42, p. 253 (1913).

† The true Banyan or Banian of India is *Ficus bengalensis*, L.

‡ Extract from Travels of Ibn Batuta.—Lee, p. 235. Translation 1829.

South-Eastern Russia to Siberia and *Acacallis cyanea*, Lindl. (t. 8678), a native of the Upper Amazon region.

Stipa Neesiana in England.—Mr. A. T. Rake, of Lawn Crescent, Kew Gardens, recently submitted for identification a *Stipa* found by him on a rubbish heap in Mortlake. It proved to be identical with the species described by Godron from Port Juvénal as *Stipa intricata*, and identified long afterwards with the South American *S. Neesiana*, Trin., or as Spegazzini thought, *S. setigera*, Presl. The grass was first recorded as far as European stations are concerned from Port Juvénal, the classical collecting ground of aliens near Montpellier.

Port Juvénal is the name of an enclosure with a wharf on the Lez canal, close to the gates of Montpellier. It was here that for over a century and a half or may be two centuries* the wool imported into Montpellier from the Mediterranean countries and later on from other parts of the world was unloaded, washed and dried for the cloth factories established near by. The wool was passed through a hot bath, washed in the river, and then spred out on gravel beds, divided into yards by stakes and sheets of coarse linen. The ground was naturally kept damp, which in connection with the high temperature of a southern climate, favoured the germination of the numerous seeds brought in with the wool. On the other hand the process of washing which involved plucking and several passages through tourniquets placed in the river must have reduced their number very much, whilst the treatment which the alien vegetation experienced during its development, such as repeated weeding, exposure to cloth which impregnated with sulphur vapours was occasionally spread over it, and the keen competition of the indigenous weeds, was unfavourable to their permanent establishment. Indeed, we must not imagine those drying yards as a botanic garden of exotics, as they have sometimes been called, but as casual nursery beds where those alien plants would come and go so that only a limited number were seen together at a given time, and long continued observation and much perseverance was required to collect the material for a florule of the place. It was mainly due to the indefatigable zeal of Touchy that Godron was enabled to write his "Florula Juvenalis sive enumeratio et descriptio plantarum e seminibus exoticis inter lanas allatis enatarum in campestribus Portus Juvenalis prope Monspelium," published in 1853, and in a second edition in 1854. The second edition contained 386 species, of which 57 were then new to science and mostly (51) of unknown origin. An appendix to this Florula Juvenalis by M. E. Cosson (in Bull. Soc. Bot. France, vol. vi. (1859) p. 607) brought the number up to 458, and a second appendix (in Bull. Soc. Bot.

* According to G. Planchon (Des Modifications de la Flore de Montpellier, p. 39), in 1700 the guild of wool merchants was authorised to use the place for drying their goods; but certain terms in the deed suggest that the neighbourhood of the wharf served for the purpose since the construction of the canal in 1686.

France, vol. xi. (1864) pp. 159–164) to 505. Several more have been added since, and Thellung in his masterly "Flore adventice de Montpellier (1912)," p. 611, estimates the number of all the exotic species recorded so far from the classical spot at 527. The drying yards of Port Juvénal were abandoned about 1880, and in 1905 Thellung found there only 10 species which had survived in the struggle with the autochthonous vegetation, most of them perennials. *Stipa intricata*, or as we must now call it. *S. Neesiana*, was not among them. It had been first observed by Touchy in 1847, and last by André in 1879. This excludes, of course, all connection between the Mortlake plant and Port Juvénal. It no doubt was introduced into the latter place more than once with different consignments of wool from South America, the imports from there beginning about 1830. When Port Juvénal was closed it still continued to come in and to spring up as a casual visitor in other places under similar conditions, such as the drying yards of Montplaisir, near Lodève, and of Bedarieux on the river Orb, both in the Herault (Thellung, l.c. 94), the banks of the Polcevera near Genoa (Sommier in Bull. Soc. Bot. Ital. 1904, p. 115), below some tan yards which receive their hides from the Argentine, or even far inland, in the neighbourhood of the Rodleben wool factory at Rosslau, Anhalt, Germany (Zobel acc. to Höck in Beih. Bot. Centralbl. vol. xxvi.)1910) p. 430), and near the Humboldts-Mühle, Tegel, Berlin (O. Schulz in Verh, Bot. Ver. Pr. Brandenb. vol. xl. p. lxxxiii.). The only other European locality where our *Stipa* was observed so far is on the beach below St. Hélène and Carras, Nice, where it was found growing in robust tufts (Goiran in Bull. Soc. Bot. Ital. 1909, p. 149), apparently unconnected with factories or landing places, but in reality no doubt traceable to them.

Godron said of his *Stipa intricata* "Patria ignota," but when in 1898 O. Schulz found the plant as a casual at the Humboldts-Mühle at Tegel, he pointed out (in Verh. Bot. Ver. Pr. Brandenb. xl. p. lxxxi.) incidentally that it had been identified with certain specimens collected by Lorentz and Hieronymus near Siambon (Tucuman) and Catamarca in the Argentine. Ascherson and Graebner (Syn. Mittel-europ. Flor. ii. (1898) p. 113) confirmed this statement, adding that Grisebach had named the Argentine plant referred to, *S. Neesiana*, Trin., a determination which seemed to them sufficiently doubtful to retain *S. intricata* as a distinct species. A comparison, however, of the Mortlake plant which is an exact counterpart of the Port Juvénal specimen in the Gay Herbarium at Kew with a co-type of *S. Neesiana* from Sellow's collection, and the rather ample material of this species from other localities, leaves no doubt about the identity of *S. intricata* and *S. Neesiana*. *S. Neesiana* is a very variable plant in the habit of the panicle, the glabrousness or hairiness of the leaves, and the colouring of the spikelets. In so far as the last character is concerned, the Mortlake specimen corresponds to Spegazzini's variety "*versicolor*" (Stipeae Platenses in Anal. Mus. Nac. Montevideo, vol. iv. p. 97). Whether the colouring of the spikelet is indicative of

more than a fluctuating state is doubtful. Its varying grades in any case do not coincide with definite areas of distribution. Spegazzini (l.c. p. 94) reduces *S. Neesiana*, Trin. to "*S. setigera*, Presl (non auct. Americae Nordicae!)" Unfortunately we do not know where Haenke's specimen came from nor is Presl's description sufficiently clear to decide the question of the identity of *S. setigera* with *S. Neesiana*. Hitchcock (*Gramineae* in Jepson, "A Flora of California," 1912, p. 105) accepts *S. setigera* as distinct from *S. Neesiana* and gives its area as from California "east to Texas and south into Mexico"; but he omits it from his "Mexican Grasses" (in Contrib. U.S. Nat. Herb. vol. xvi. part 3, 1913). Such Californian specimens of *S. setigera* as I have seen are certainly not identical with *S. Neesiana* and as Hitchcock had the opportunity of studying Presl's types in the National Collections at Prague, we may assume that he is right, and retain therefore the name of *S. Neesiana*, Trin. for the South American grass.

The area of *S. Neesiana* covers parts of Southern Brazil, the whole of Uruguay and the Argentine, south to the Rio Negro and west to the Andes. According to Spegazzini it is very common (vulgatissima) throughout the pampas from the Rio Negro to Salta. Stuckert (Graminaceas Argentinas in Anal. Mus. Nac. Buenos Ayres, vol xi. (1904), p. 99) says it is fairly good fodder, but extremely troublesome when in fruit as the sharp hard calli of the spikelets quickly bore themselves into the skins of animals, causing painful wounds. The grass is known to the natives as Flechilla, *i.e.*, Little Dart, a designation which is certainly not inappropriate.

Nothing definite is known as to how the grass reached its station at Mortlake, but the rubbish heap having been formed from the refuse of a dust destructor close by where hides are frequently destroyed we may infer that spikelets attached to hides, probably from the Argentine, were introduced with them, became detached somehow, and finally found their way to where at present (August 11th) the fine vigorous clump of *Stipa Neesiana* stands. The grass is a perennial and the clump in question must have stood at least one winter and appears, therefore, quite hardy. No other Argentine or South American plants have so far been seen associated with it, but it may be mentioned rather as a curious fact than a circumstance connected with the grass, that a large crop of vigorous date palm seedlings has sprung up in the same locality.

O. S.

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XL.—BRAZIL-WOOD.

J. H. Holland.

The Brazil-wood of the xivth-xvth century was obtained from the East—India, Malaya, Ceylon, &c., and the tree producing it may therefore be properly attributed to *Caesalpinia Sappan*, the only dye-wood that would seem to fit the earlier descriptions. But it cannot be taken as conclusive that this was the only "brazil" of the period, since Marco Polo, who travelled in the East about 1260, in his description of Lambri* remarks, "They have plenty of camphor and of all sorts of other spices; they have also 'brazil' in great quantities. This they sow, and when it is grown to the size of a small shoot they take it up and transplant it; then they let it grow for three years, after which they tear it up by the root. You must know that Messer Marco Polo aforesaid brought some seed of the 'brazil,' such as they sow, to Venice with him, and had it sown there, but never a thing came up, and I fancy it was because the climate was too cold." This description suggests *Morinda citrifolia*, a red-dye plant known as "Al," grown under similar conditions in India to this day, though the cultivation is almost if not entirely abandoned as an industry, since the introduction of aniline dyes. It is a small tree that may be treated as a biennial or triennial as above recorded.† That the same traveller had some knowledge of another "brazil" is clear when he says, "When you leave the island of Java (the less) and the kingdom of Lambri, you sail north about 150 miles and then you come to two islands, one of which is called Necuveran (Nicobars of the present day).‡ . . . Their woods are all of noble and valuable kinds of trees, such as 'Red Sanders' and 'Indian-nut' and 'Cloves' and 'Brazil,' and sundry other good spices."§ Again, according to Yule,‖ the Brazil wood of Kaulam (Malabar) appears in the Commercial Handbook of Pegolotti (circa 1340) as "Verzino

* Yule (1871), Travels of Marco Polo, ii. p. 241. Lambri is believed to be N.W. of Sumatra.

† *Ventilago maderaspatana*, Gaertn. and *Oldenlandia umbellata*, Linn., both roots yielding a red dye may perhaps also be suggested.

‡ Yule, l.c. p. 249.

§ l.c. p. 248. ‖ l.c. p. 315.

colombino," and he further details kinds of Brazil as "Verzino salvatico," "Verzino dimestico," and "Verzino colombino." "Red Sanders Wood" (*Pterocarpus santalinus*)* as a possible source of the Eastern "brazil" is disposed of by the fact that it does not yield any colour to water, though the close general resemblance appears to be sufficient to have permitted an occasional swindle. It is related by Garcia da Orta (1490-1570) in his "Colloquies on the Simples and Drugs of India"† when asked, "How do you know that this red kind is 'sandal' and not 'brazil,' for neither of them has scent?" replied, "It is true that neither has a good scent, but the 'brazil' is softer and more dyed. It was in this way that a friend of mine, a merchant, was a loser, for he bought red sandal for brazil, and the dyers found that it gave no dye and he found no sale for it."

It does not seem possible to say exactly when the wood of *Caesalpinia Sappan* lost its identity, as "brazil" (brésil, French; Verzino, Italian; Lignum brasile or brasyle, &c., &c.), nor yet the period when it became better known in this country by its Malay name of "Sappan." Under the former name it was certainly an important article of commerce in the middle ages. Flückiger and Hanbury,‡ quoting from "Tarif des Péages," or "Customs Tariff" of the Counts of Provence in the middle of the 13th century, mentions "brazil-wood" amongst other imports from the East. Most dictionary articles quote Marco Polo for brazil, and Chaucer (1340-1400)§ is early enough with "brasil" to mean the same wood. One hundred years or so later (May 3rd, 1500), Brazil was discovered, and the country received this name because of the large quantities of a red-dye wood found growing there. It seems probable that this wood, being of superior quality, superseded that of *Caesalpinia Sappan*. In its turn the Brazilian wood has been replaced to a large extent by "Cam-

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* *Pterocarpus santalinus* does in fact yield a red-dye, but unlike the brazil woods it does not yield colour to water but requires alcohol or ether to extract it. The watery solution of a few chips shows a strong fluorescence somewhat like that of "Lignum Nephriticum" (*Eysenhardtia amorphoides*; see *Kew Bull.*, 1909, p. 203). A "Note on the Colouring matter of Red Sanders Wood," by Dr. P. Bolley, is given in the Pharm. Journ., Series i. Vol. vii. (1847), p. 288. It may be concluded that the method of extracting the dye was not known in the ancient times referred to above; the more modern ages show an important trade in it as a dye-wood, but at the present time it is apparently of no value, especially since the introduction of synthetic dyes. The red colour is due to Santalin and not to Brasilin as in the Brazil woods. Watt (Comm. Prod. India) states that the dye is still used in India for marking idols and for staining the forehead in certain caste markings. It may, however, be pointed out that the "Red Sanders" alluded to by Marco Polo cannot well be *Pterocarpus santalinus*, which is confined to Southern India. Marco Polo refers to two islands, one of which is Necuveran, a name probably covering the whole of the Nicobar group. His second island may therefore be taken as meaning the Andaman group. There is no tree in the Nicobars which resembles *P. santalinus*, but in the Andamans there is a species *Pterocarpus dalbergioides* confined as a wild tree to this group which has a red timber known in the trade as "Andaman Red wood." (See Prain, Indian Forester, XXVI. No. 10, Oct., 1900, Report on the Indian species of *Pterocarpus*, pp. 1–16.)

† Markham, Transl. (London, 1913), pp. 393–395.

‡ Pharmacographia, p. 635.

§ Encycl. Dict., Cassell & Co., i. p. 769.

wood" (*Baphia nitida*)* from West Africa. Thomson† states that "within the last ten years Brazil wood has been nearly superseded by a wood imported from Africa, to which our dyers give the name of 'camwood.' It is richer and gives a finer colour than any of the varieties of brazil wood." The relative position of "sappan wood," "brazil wood" and "camwood" in 1787–1834, was approximately as follows:—In 1787 the duty was £33 per cent. for sappan and camwood, while brazil was duty free, in 1819 the duty for sappan and brazil wood was £20 per cent. and for camwood 15s. per ton. In 1834 the price on the London Market for sappan wood was from £8 to £14 per ton, with a duty of 1s. per ton, for brazil wood from £60 to £80 per ton, exclusive of the duty of £2 per ton, and for camwood £16 to £18 per ton, inclusive of a duty of 5s. a ton. At this period (1834), of sappan wood, it was stated that "very little is now imported"; of brazil wood, the imports "inconsiderable," and of camwood "there were imported 475 tons in 1828 and 119 tons in 1829."‡ The exports of brazil wood from Bahia in 1878 were 821 kilos, almost entirely to the United States.§

At the present time "camwood" is the only one of the three above-mentioned products that is quoted on the markets, a recent Liverpool report showing it as valued at £12 15s. 0d. per ton. Brazil wood for medicinal purposes was quoted in 1879 at 1s. 6d. per lb., but in this connection as well as for dyeing purposes it is now neglected, and recent enquiries at several large establishments in London show that the product is scarcely known.

There are unfortunately no herbarium specimens showing any association with the name "brazil," and accordingly the literature though extensive—consisting more often than not of mere notes—has to be almost entirely relied upon to separate the different woods. The following eight trees seem the more probable sources of brazil wood, all having been called, amongst other names, "brazil," or "braziletto," by various authors. An outline of the pod of each is given.

Caesalpinia Sappan, *Linn.* Sp. Pl. (1753), p. 381. A small thorny tree; flowers yellow; pod 3-4 in. long by 1½ in. thick, compressed, smooth, with a hard cuspidate or recurved beak at the end, containing 2 to 4 brown seeds.

The "brazil-wood" of early times (before 1500), usually known at the present day as "sappan-wood"; also known as "bakam-wood," "red-wood," etc. Bresillet des Indes of Lamarck, Encyl. Method. i. (1783), p. 462. Native of the Malay Peninsula and Malay Archipelago.

The dark heart-wood was formerly largely used in this country, and to some extent may still be used; but its use is now more common in the countries of production. It is probably the oldest dye-wood known, having been in use for some 700 years. In addition to the references by Marco Polo and Garcia d'Orta,

* Particulars of this dye-wood tree are given in Kew Bull. Add. Series ix. 2 (1911), pp. 246–247. See also Kew Bull. 1906, pp. 373–375.

† Chemistry of Organic Bodies—Vegetables (London, 1838), p. 410.

‡ McCulloch, Dict. Commerce (London, 1834).

§ Spon's Encycl. (1881), p. 856.

an early trade is recorded with India and Batavia in letters by the Officers of the Factories of the East India Company in 1638—"the *Blessing* would be dispatched to Surat within five days, carrying calicoes, saltpetre, 'sappan-wood,'"* and "from Battavia for this place three ships commanded by Vanderbrooke were dispeeded," two of which, viz., second and third ship arrived the 30th of October, and having landed here "sapon-wood, sandall, nutmeggs, elephant's teeth."† It will be noted in these letters that the name "brazil" is not used, nor does it occur in Foster's works from 1618.

Some particulars of the present day trade in this wood, with references to literature, etc., are given in *Kew Bulletin*, Add. Series IX. part 2, 1911, p. 252.

Caesalpinia echinata, *Lam.* Encycl. Method. i. (1783), p. 461.

A large tree with reddish and thorny bark; leaflets ovate-obtuse; flowers yellow and red, fragrant; pods about 3 in. long 1 in. broad, prickly, containing two flat, brown seeds.

Pseudo santalum rubrum f. arbor Brasilia (Bauhin, 1623; Plukenet, 1696). "Ibira-pitanga" or "ymira-piranga"; Lignum rubrum of Brazil (Marcgravi de Liebstad, 1648; Guilielmi Pisonis, 1658; Martius, 1870-76). "Brazil Wood" (of the period after 1500; Pomet, 1694; Barham, 1794); "Fernambouc," "Fernambuc," or "Pernambuco" Wood; "Bois de Bresil," "Bresillet de Fernambouc" (Lamarck, 1783); "Pao de Rainha," or "Queen's Wood" (Holtzapffel, 1852).

According to Pomet, as early as 1694-1725 this wood was regarded as the best of the Brazil woods, of which he says, "We sell to the dyers several sorts of redwoods by the name of Brazil. The first that is most esteemed and most in use is the Brazil wood called Farnambuck, because it is brought from a place of that name in Brazil."‡ He concludes his enumeration of five sorts as follows:—"Likewise that which makes so many different kinds of 'Brasil-wood' is nothing else but the several places and difference of the soil where the wood grows," and "As to the 'Brasil chips' the best account I can give you of it is to trust to the honesty of the merchant with whom you deal."§

Barham‖ states that "the true Brazil is called Pernambuco wood, being the place from whence they come in Brazil, the Brazilians calling it "Ibirapitanga. . ." This wood is used among the dyers, and the stationers make red ink of it." Lunan¶ 20 years later, quotes Barham; but in the course of another 20 years or so this wood seems to have been losing its importance as according to Thomson,** it was being superseded from about 1828 by "camwood" from West Africa. At the Exposition

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* William Fremlin at Gombroon to the Company, Jan. 13th, 1638; Foster, The English Factories in India, 1637–1641 p. 40.

† President Fremlin and others at Surat to the Company, Dec., 1639; Foster, l.c. p. 218.

‡ Pomet's figure of the tree, however—Hist. Gen. des Drogues, iii. Paris, 1694, p. 119; English edition, London, 1725, p. 53, t. 24, appears to be more or less fanciful and does not correctly portray any Brazil Wood tree then known.

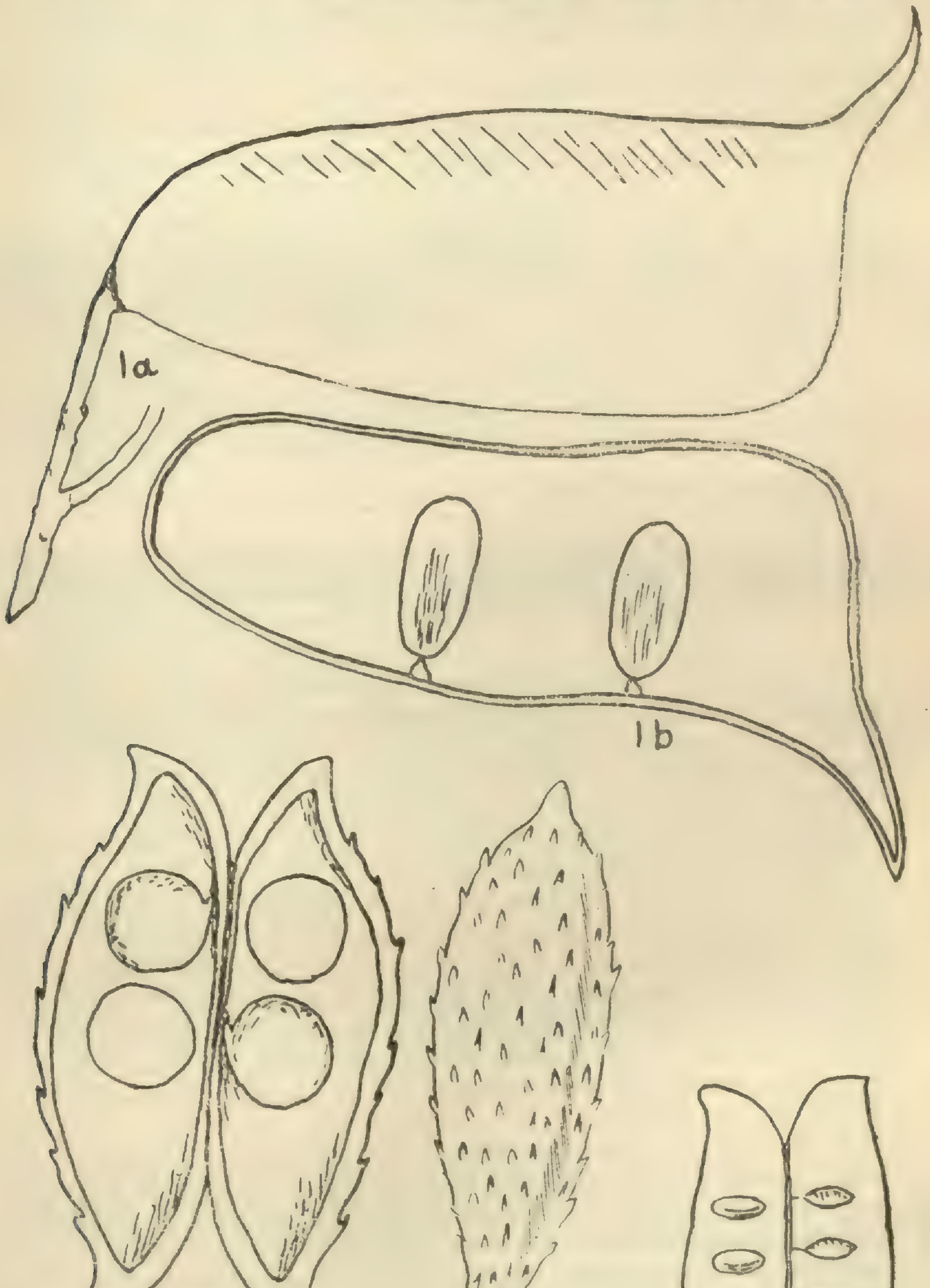
§ l.c. Eng. ed. p. 68.

‖ Hortus Americanus (1794), p. 23.

¶ Hortus Jamaicensis, i. (1814), p. 111.

** Chemistry of Organic Bodies—Vegetables (1838), p. 410.

Universelle de Bruxelles, 1910, in a pamphlet published by the Commission d'Expansion Economique du Brésil: "Exploitation des Bois," it was stated that "Pao Brazil," "Ibirapitanga," ou "Arabutan" (*Caesalpinia echinata*), which was formerly



1. *Caesalpinia Sappan*; 2. *C. echinata*; 3. *C. brasiliensis.*

exported in large quantities to Europe for dyeing is to day almost abandoned for this purpose; the wood is used for constructional work, railway sleepers, etc.; the density is recorded as 1·185.

There is a sample of Brazil wood chips in the Kew Museum, presented by J. Glover, dated 1849. This would be such as came into commerce at that time.

Caesalpinia brasiliensis, *Linn.* Sp. Pl. i. (1753) p. 380.

A small prickly tree or undershrub, about 4 ft. high; trunk about 8-12 in. in diameter. Leaves alternate; leaflets rounded oval, entire, glabrous, bright green. Flowers of a pale or whitish green. Pod 5-seeded. *Caesalpinia crista,* Lam. Encycl. Method. i. (1783) p. 462. *Caesalpinia polyphylla aculeis horrida,* Plumier, Gen. (1793) p. 28, t. 9 and Burmann, Pl. Americanum . . . Carolus Plumerius . . . etc.; i. (1755) t. 68.

Brasiletto of the Antilles.

Lamarck (l.c.) states that this is called Brésillet in the Antilles because the heartwood is red like that of Brazil wood.

Caesalpinia bahamensis, *Lam.* Encycl. Method. i. (1783), p. 461.

A medium sized tree or shrub, 8–9 ft. in height; stems 2–3 in. in diameter; branches slender, armed with small black prickles at the base of the leaves. Inflorescence a terminal raceme; flowers white. Leaves (pinnae) 4-jugal; leaflets of firm texture, obovate-mucronate, light green, somewhat resembling those of *Haematoxylon.* Pod thin, oblique acuminate, or pointed like a scimitar about 3 in. long, 5-7 or more seeded. *Pseudosantalum croceum,* Catesby, Nat. Hist. Carolina, Florida and Bahama Islands, ii. (1754), t. 51; *Caesalpinia brasiliensis,* Plenck, Ic. (1791) t. 324; *Caesalpinia crista,* Griseb. Fl. Br. W. Indies (1864) p. 205.

Brasiletto of the Bahamas.

Bahamas (N. L. Britton & C. F. Millspaugh, No. 2883, 1905; John & Alice Northrop, Bahama Pl. No. 426 (coll. 1890) 1899, Herb. Kew).

About 200 years ago this wood was a considerable article of commerce in the Bahama Islands; but in Catesby's day the supply was much exhausted, great quantities of it being sent from the islands and also from other parts of the West Indies to England for dyeing.

It is probable that this and *C. crista* represent the "little Brazil wood" of Pomet*, the least esteemed of his five kinds, as may also the wood referred to as Braziletto (Nattali & Bond)† which came into England from the West Indies under duty of 3s. per ton, and the demand for which was at one time so great that scarcely any large trees were left in the British plantations. It is in this work called *Caesalpinia vesicaria,* and said not to attain to so large a growth as *C. crista* (by which *C. echinata* is doubtless intended). The description—branches slender and full of small prickles; the flowers white growing in a pyramidal spike at the end of a long slender stalk—would seem to fit this species as it

* A Compleat Hist. of Drugs (1725), p. 68.
† Vegetable Substances: Materials of Manufacture, p. 361.

is the only one of the series under consideration with white flowers.

Grisard & Van den Berghe* would infer this species in the statement "Quant aux bois de 'Bahama' egalement† utilises en teinture, mais n'ont aucune importance commerciale et industrielle en Europe."

The wood of "Braziletto" (*Caesalpinia bahamensis*) is recorded‡ as being imported from New Providence in 1857.

Caesalpinia bicolor, *C. H. Wright, Kew Bull.*, 1896, p. 22.

A small tree 15–20 ft. high, branching from the base; stems up to 3 in. in diameter, branches scantily armed with thorns. Leaves bipinnate with 8–12 alternate ovate-emarginate leaflets. Flowers red-purple. Pod flat, 2 in. long, 1 in. wide, 5-seeded.

Native of Peru and Colombia.

Said to yield a very fine "Brazil-wood" the dye from which was ascertained by the late Daniel Hanbury to be superior to that yielded by the best Pernambuco Brazil wood.§ A specimen of the wood, however, forwarded by Mr. White from Colombia to Kew in 1897 was examined by Prof. Hummel at the Yorkshire College, Leeds, who reported (Nov. 2nd, 1897) that "the sample of wood of *Caesalpinia bicolor* received for examination has so little colouring power that it may be regarded as of no commercial value."‖ A note on this wood as "A New Brazil Wood" is given in *Kew Bulletin*, 1896, p. 223.

On a writing received at the same time as a sample of seeds, 1896¶ it is recorded, "This is ink made from *C. bicolor*. It may change colour as I notice it has already on the packet of seeds. The reason is that any alcali turns it purple and lessens the stability of the colour, which is almost a carmine. I have, however, writing 28 years old which has kept its colour well." This note is dated 10/6/96, and the colour is still good.

Peltophorum brasiliense (*Sw.*), *Urban*, Symb. Ant. Fl. Ind. Occid. ii. (1900–01) p. 285.

A spreading tree up to 15 ft. high (Macfadyen) up to 80 ft. with a trunk 4 ft. in diameter (Harris); branches unarmed. Leaves bipinnate; pinnae 4-paired; leaflets 7–8-paired, sub-opposite, oval obtuse at the apex, 1–1½ in. long. Inflorescence a raceme, axillary or paniculate at the ends of the branches; flowers small, yellow. Pod flat, chartaceous or leaf-like, 2½ in. long, about 1 in. broad; seeds 4, compressed ovoid. *Pseudosantalum croceum*, Sloane, Nat. Hist. Jamaica, ii. (1725) p. 184, t. 231, ff. 3, 4; *Caesalpinia brasiliensis*, Linn. Sp. Pl. i. (1753) p. 380. (in part); *C. brasiliensis*, Sw. Obs. (1791) p. 166; *C. brasiliensis*, Macfadyen, Fl. Jamaica (1837) p. 328; *Peltophorum Linnaei*, Benth. in Hook. Journ. Bot. ii. (1840) p. 75; *P. Linnaei*, Griseb. Fl. B. W. Indies (1864) p. 206; *Caesalpinia cubensis*, Greeme, Trans. Acad. St. Louis. vii. (1897) p. 416 t. 32.

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* Les Bois Industr. Indig. et Exot. in Bull. Soc. d'Accl., 1894, p. 323.
† Referring here to Nicaragua wood.
‡ Redwood, Suppl. Pharmacopœia (London, 1857), p. 267.
§ White, Specimen No. 11, 1895, in Herb. Kew.
‖ Note with specimen of the wood in Museum, Kew.
¶ White, Palmira, Colombia, specimen in Museum, Kew.

Braziletto of Jamaica (Sloane, Browne, Macfadyen).

Jamaica (Harris, Nos. 5438, 5439 (1894) Herb. Kew; Macfadyen (1838) Herb. Kew). Cuba (Combs, No. 571 (1895) Herb. Kew).

Commelin* describes a red-dye wood which he calls "Corallinum Lignum" (*Erythroxylum americanum*) and the figure is a cultivated plant three years old and 3 ft. high, originally from the American island of Aruba. From this same island there is in the Kew Herbarium specimens of a pod, leaves and flower sent by Dr. Suringar of Leiden in 1884, which has been described by Prof. Urban as *Peltophorum Suringari*.†

According to Browne‡ this tree grows in every part of the island where the soil is dry and rocky. The wood rarely exceeds 8–10 in. in diameter; it is elastic, tough and durable, of a fine orange colour. In his day it was seldom cut for the dyer's use in Jamaica, and the cultivated "Logwood" (*Haematoxylon campechianum*) has long since superseded it from this island.

Macfadyen§ states "I am not aware that it is at present ever cut down for exportation as a dye-wood;" though it is probably this wood that is meant by Holtzapffel‖ where he states that "Braziletto is quite unlike the Brazil wood; its colour is ruddy orange, sometimes with streaks; it is imported from Jamaica in sawn logs from 2-6 ft. long and 2-8 in. in diameter with the bark (which is of the ordinary thickness) left on them and also from New Providence in small cleaned sticks." There are in the Museum at Kew two specimens of the wood of the Jamaica Braziletto that would bear out these views—one of them from the Paris Exhibition, 1855, is described as being used for ornamental cabinet work and for wheel spokes—but there is no record of the use of either as a dye-wood. The chips of both specimens, however, yield a red colour in water though of not so pronounced a tint as that obtained from Brazil wood chips or from Lima wood in the Museum.

Harris¶ describes this tree as one of the best native timbers, found in most parts of the island; wood hard and durable, of a bright red colour; used for railway sleepers, wheel-spokes, ornamental cabinet work and for general purposes.

Haematoxylon Brasiletto, *Karst.*, Fl. Colombia, ii. (1862-69) p. 27. t. 114.

A shrub or small tree, 8–12 ft. high; stem 6 in. in diameter, armed with stout axillary thorns, 3–4 lin. long; 3–5 ft. high, stem deeply furrowed with dull greenish grey bark. Leaves resembling those of *H. campechianum*. Inflorescence as in the species referred to but flowers larger and less numerous. Pod flat, 1–1½ in. long. *Haematoxylon Brasiletto*, Engl. Bot. Jahrb. viii. p. 344; Harms in Engl. Bot. Jahrb. xxix. p. 102; *H. campechianum*, H. B. & K. Nov. Gen. vi. (1823) p. 256 (in part);

* Hort. Med. Amstel. i. (1697), t. 104, p. 203.
† Urban, Symb. Ant. Fl. Ind. Occid. v, p. 363 (1908).
‡ Hist. Jamaica (1789), p. 227.
§ Fl. Jamaica (1837), p. 328.
‖ Descr. Cat. Woods (London, 1852), p. 77.
¶ Timbers of Jamaica, West Indian Bull. ix. No. 4, 1909, p. 301.

H. boreale, S. Watson in Proc. Amer. Acad. xxi. (1886), p. 426; Rose in Contr. U.S. Nat. Herb. v. (1899) p. 237.

4. *Caesalpinia bahamensis*; 5. *C. bicolor*.
6. *Peltophorum brasiliense*.
7. *Haematoxylon Brasiletto*; 8. *H. campechianum*.

Brasil or Braziletto of Colombia (Karsten); Mexico (Watson, Rose). Palo Brazil of Salvador.* ?Nicaragua Wood, Lima Wood, Peach Wood or Wood of St. Martha. Blood Wood or Red wood of Nicaragua (Dampier); Bois de Lima or Bois de Californie.†

Colombia, Santa Marta (H. Smith, No. 258, 1903, Herb. Kew);

* Expos. Univ. Paris, 1878, Cat., p. 28—*Emaloxylum Braçileo*.
† Grisard and Van-den-Berghe, Bull. Soc. d'Accl. 1894, p. 322.

Venezuela (Ernst, Exp. Nacion. Venezuela, i. (1883) p. 248); Mexico (Palmer, No. 125, 1885, Harms, No. 1715, Herb. Kew); Guatemala (Harms, No. 3343, Herb. Kew); Lower California (Palmer, No. 48, 1890, Herb. Kew).

With a view to determining the origin of "Nicaragua," "Lima" or "Peach" wood, the specimens of "Lima" and "Peach wood" in the Museum presented by W. Gourlie have been examined in the Jodrell Laboratory, and Mr. Boodle reports as follows:—

"On comparing four blocks of wood two of which are named 'Logwood,' one 'Streaked logwood,' and one 'bastard logwood,' the structure was found to agree fairly closely but showed some range in certain particulars, *e.g.*, the size of the wood-vessels. Two of these blocks (namely, *Haematoxylon campechianum*, Indian Forestry Dept., O. 4571, Bot. Garden, Saharanpur, and logwood from the collection of the late Prof. Henslow, 1861) are strongly coloured and yield an extract in water which after the addition of an alkali* turns purple, like the colour of Kleinenberg's haematoxylene. These two specimens may be accepted as *Haematoxylon campechianum*. Of the two remaining blocks, one ('Streaked logwood' from New York, Messrs. A. Lascelles & Co., 1895) gives an extract similar to that obtained from the first two specimens but shows decidedly less colour, while the other block ('bastard logwood,' Messrs. A. Lascelles & Co., New York, 1895) appears to contain none of this colouring matter, and yields only a brown extract. These last two blocks may be the wood of varieties of *H. campechianum*† and may be described as 'bastard logwood' of two different grades.

"A specimen of 'peach wood' (W. Gourlie) and one of 'Lima wood' (W. Gourlie) are decidedly similar to one another and also to logwood in structure, but they both give a red extract in alkaline water, agreeing in colour with an alkaline solution of brazilin. 'Peach wood' is mentioned by Wehmer‡ as the same as 'St. Martha wood.'

"Three other specimens of wood examined are as follows:—(1) 'Brazil wood,' Mexico; Paris Exhibition, 1900; (2) 'Brazil wood,' J. Glover, 1849; (3) 'Sappan wood,' Madras, Dr. Bidie. These all yield a dye which agrees in colour with brasilin in alkaline solution. They differ from one another as follows: No. 1 is distinguished by having rather larger medullary rays than No. 3, while No. 2 differs from Nos. 1 and 3 in having a distinct tier-like arrangement of the rays. In Nos. 2 and 3 tangential bands of parenchyma are much less marked than in No. 1 which approaches 'Peach wood,' 'Lima wood' and *Haematoxylon campechianum* in structure. No. 1 appears not to be true 'Brazil wood,' but Nos. 2 and 3 are probably correctly named, No. 2 being in that case true 'Brazil wood,' which is stated to

* The chips were boiled in water and some ammonia was then added to the coloured liquid.

† See Gruenberg & Gies, Bull. Torrey Bot. Club, vol. xxxi. p. 367.

‡ Wehmer, Die Pflanzenstoffe, p. 324.

be derived from *Caesalpinia echinata*, Lam.* and No. 3 the wood of *Caesalpinia Sappan.*"

The above report is placed with this species because the Museum specimens—Lima and Peach wood—referred to both possess a structure like that of Logwood, but yield a different extract resembling more that of Brazil wood.

Dampier† (1676) who appears to have had a better practical knowledge of the dye woods of the period than any other traveller at that time, recognised in Nicaragua wood something quite different from Logwood—in which trade he worked—and separates with accuracy the contemporary woods; he states:—

"There are other sorts of wood much like it in colour, and used for dyeing also; some more esteemed, others of lesser value. Of these sorts bloodwood, redwood, or Nicaragua wood, and stockfish wood or stockfish-hout are of the natural growth of America.

"The Gulph of Nicaragua, which opens against the Isle of Providence, is the only place that I know in the north seas that produces the bloodwood, and the land on the other side of the country against it in the south seas, produceth the same sorts. The wood is of a brighter red than the logwood.‡ It was sold for thirty pounds per ton, when logwood was but at fourteen or fifteen, and at the same time stockfish wood§ went at seven or eight. This last sort grows in the country near Rio la Hacha to the east of St. Martha, by the sides of rivers in the low land. It is a smaller sort of wood than the former. I have seen a tree much like the logwood in the river of Conception in the Samballas, and I know it will dye, but whether it be either of these two sorts, I know not; besides here and in the places before mentioned, I have not met with any such wood in America.

"At Sherbero, near Sierra Leone, in Africa, there is Camwood‖ which is much like bloodwood, if not the same. And at Tonquin, in the East Indies, there is also such another sort:¶ I have not heard of any more in any part of the world."

He further records** in reference to Nicoya, that "by the sea-side in some places there grew some redwood useful in dyeing"; of this, some Spanish Indians informed him that there was little profit made because they were forced to send it to the lake of Nicaragua. At one place he saw 3 or 4 tons of the redwood which he took to be "that sort of wood called in Jamaica, bloodwood or Nicaragua wood."

That "Peach" and "Lima" woods are derived from the same source is borne out by McCulloch†† and Poole,‡‡ who give statistics of the commerce, and also include Nicaragua wood as a synonym. McCulloch says of "Nicaragua wood or peachwood.

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* Weisner, Die Rohstoffe des Pflanzenreiches, ii. p. 932.
† Capt. William Dampier, Voy. Advent. i. (Liverpool, 1769), p. 60.
‡ *Haematoxylon campechianum.*
§ *Chlorophoria tinctoria.* "Fustic" of the present day.
‖ *Baphia nitida.*
¶ *Caesalpinia Sappan.*
** Dampier, l.c. i. p. 248.
†† Dict. of Commerce (1834), pp. 851, 852.
‡‡ Statistics of Commerce (1852), pp. 217, 234.

the London dealers distinguish Nicaragua wood into 3 sorts, viz. large (price, £14 to £20 per ton), middling (£8 to £10 per ton), and small (£7 to £8 per ton).'' Poole refers to Lima wood as "the finest description of Nicaragua wood, price £13 to £15 per ton duty free (1852), brought from Realijo, Rio de la Hache and Mazatlan ''—all localities where we should expect to find *Haematoxylon Brasiletto*. Unfortunately there is no authentic specimen of this wood in the Museum. But, on the request of the Director, specimens have been promised from Colombia, together with herbarium material of the tree, and until these arrive the statements quoted above can only be regarded as provisional.

There is not much doubt that the wood of this species has at times been confounded with that of *H. campechianum*.

Bedford Pim* may imply this species when he refers to logwood, because the trade referred to is that of Granada on Lake Nicaragua. Whatever may have been intended, however, his note is interesting as showing how the wood was conveyed from the Pacific side to the Atlantic about 50 years ago. "The commerce of Granada is carried on in bongos, which are very primitive specimens of naval architecture, simply a rudely constructed barge of from 8-10 tons. . . . The crew generally consists of 12 men and the patron; these men eat, drink and sleep on their respective thwarts. The cargo is made up of about 100 seroons of indigo or 500 hides or 8 tons of logwood. . . . As may be imagined the bongo is not easily moved, in the wet season for example the average passage up the San Juan alone is 14 days; they are often three weeks from Granada to Greytown."†

According to Rose‡ though "*Haematoxylon campechianum* is supposed to be the logwood of commerce, the above species is largely exported under that name and has been for many years." In Mexico he further states the wood known as "Brazil" is largely used throughout the country as a dye-wood, giving a dark brown or red colour, used to colour tomales, mats, and Agave fibre. It is not now so extensively exported from the West Coast as formerly, but it is one of the chief exports from Altata, while much wood is shipped from Piaxtla and also from Mazatlan. The wood from Altata goes chiefly to Havre and Hamburg, ships often being loaded with this wood alone. On account of this extensive cutting it is hard to find specimens of any size along the coast, but in some of the hot interior valleys large shrubs or even small trees are to be seen.

In Venezuela the wood of this species is said to be scarce and little exported—51,342 kilos were shipped from Venezuelan ports in 1882-1883. The scarcity is attributed largely to "the fatal practice of cutting without sowing, a practice which is unfortunately the general rule in the forestry of this country."§

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* "The Gate of the Pacific" (1863), p. 291.

† On the Atlantic side connected by the San Juan with Lake Nicaragua.

‡ Notes on Useful Plants of Mexico in Contr. from the U.S. Nat. Herb. v. 1899, p. 238.

§ Ernst, La Exposicion Nacional de Venezuela en 1883, i. (Caracas, 1886), p. 248.

Haematoxylon campechianum, *Linn.* Sp. Pl. (1753), p. 384.

A small tree 15-20 ft. high; stem straight in young trees, at times ultimately becoming gnarled or twisted. Leaves pinnate with 4 or sometimes 5 pairs of leaflets, obcordate, glabrous, green. Inflorescence a lax axillary raceme; flowers small, petals 5, yellow. Pod membranous, flat, lanceolate, $1\frac{1}{2}$-2 in. long, 1-2 seeded.

Palo del Campeche, Palo del Brasil, of Tabasco, Mexico†; Logwood, Campeachy wood, Poachwood,‡ Jamaica wood, Bluewood, Blackwood.

There are specimens in the Kew Herbarium from the following places: Jamaica, Trinidad, Tobago, New Providence, Bahama Islands, Mauritius, Dominica, St. Lucia, Porto Rico, Martinique, Cuba, St. Dominique, Guadeloupe, Rodriguez, Madagascar, Gold Coast, Calcutta.

These localities without exception represent cultivated trees, the original home of the plant being Campeachy, Yucatan and British Honduras. In Southern Nigeria it is well established at Oloke Meji, and in Old Calabar a tree planted about 1892 was bearing seeds in 1897.

The principal commercial sources are Campeachy, Yucatan, British Honduras, Mexico, Haiti, St. Domingo, Jamaica, etc. In the Republic of Honduras it is reported§ that Logwood cannot be found there in commercial quantities.

Of all the countries into which Logwood has been introduced it is probable that Jamaica is the most important commercial source. It was introduced into the Colony in 1715, but before then the island was the centre of a large trade in the wood. Sloane‖ records that it was cut about the town of Campeche and brought to Jamaica in sloops to be sent to Europe by the traders there, and that "since the year 1715 the first sowing of this seed in Jamaica, many trees have now (1725) produced ripe seeds." In 1876 it was calculated that the tree occupied at least 200 square miles of the island.¶ It appears to have been introduced to New Providence about 1722. Catesby** mentions that "in the year 1725 I saw three of these trees in the island of Providence which were raised from seeds brought from the Bay of Honduras by Mr. Spatches, a person of more than common curiosity. He told me they were of three years' growth from the seeds, they were then about 14 ft. high, their trunks straight and about 7 or 8 in. thick, their heads branching regularly and being in full blossom made a beautiful appearance." It is interesting to note that a large export trade has now grown up in logwood from the Bahamas.††

The trade in the wood was at the first in the hands of the Spaniards, and an important centre of the cutting was Champeton

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† Ramirez, Pl. Mexicanum Sin. Vulg. y Cientifica, Mexico, 1902, p. 52.
‡ Gerth van Wijk, Dict. of Plant Names, 1911.
§ Commerce Report, Washington, No. 305, Dec. 30th, 1915.
‖ Hist. Jamaica, ii. (1725), p. 183.
¶ Thomson, Rep. Jamaica Coll. Inter. Exhib., Philadelphia, 1876.
** Nat. Hist. Carolina, Florida and the Bahama Islands, ii. (1754), p. 66.
†† Report of the Development Board of the Bahamas, 31st March, 1916: West India Comm. Circ. July 27th, 1916, p. 286.

river, about 10 or 12 leagues to leeward of Campeachy town. It was then worth £90 to £110 a ton, and the Indians cut it for a ryal a day.* Dampier's cargo (1675) to purchase logwood was rum and sugar—very good commodities, he thought, for the logwood cutters, then about 250 men, mostly English, who had settled in the neighbourhood of One-Bush-Key, Campeachy Bay.†

In the early days of the trade the value of the wood was little known, and it is said that privateers who took ships laden with it saved only the nails and ironwork before sinking them, and it is related that a Captain James who had taken a ship laden with logwood burnt the wood throughout the voyage home, though on arrival he sold the remainder at great profit. It was after his return to Jamaica that the English are said to have discovered where the tree grew in the Bay of Campeachy, and "if they met no prize at sea they would go to Champeton river where they were certain to find large piles cut to their hand."‡ For a time the wood was collected under this system of poaching.§ Catesby‖ refers to the bloody disputes which this useful tree occasioned between the Spaniards and the English, and he suggested that the inhabitants of their southern plantations should propagate it to their advantage against the time when they would be wholly deprived of getting it from the Spaniards as usual by force or stealth.

In the reign of Queen Elizabeth, about the time when this wood appears to have been first used as a dye, an Act of Parliament was passed in the 23rd year of her reign (1582) prohibiting its use as a dye under severe penalties, because the colours produced by it proved so fugacious that a general outcry against its use was raised. This law was repealed after being in force for about 100 years, after the discovery "of fixing colours made of 'logwood' alias 'blackwood,' so that by experience they are found as lasting as the colours made with any other sort of dyeing wood whatever."¶ The name 'blackwood' it appears had been given when the wood was used surreptitiously during the period when its use was prohibited by law.

Logwood, since its introduction, has generally maintained its position, and though of less value, after the introduction of the aniline dyes, the trade has never been entirely killed as is the case with most other vegetable dyes; at the present time, owing to the depression in the dye industry on account of the war, the trade has improved everywhere almost to the point of speculation. The use of natural dye-stuffs by American manufacturers represented an output during 1914 to the value of $1,866,000, the chief of which was logwood extract—14,500

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* Dampier, l.c. i. p. 49.

† l.c. i. p. 21.

‡ l.c. i. p. 49.

§ The name "Poach-wood" given above may have arisen in this way, though I cannot be sure that it may not be intended for "Peach-wood," a name sometimes attributed to this species as well as to *H. Brasiletto*.

‖ Nat. Hist. Carolina, Florida, Bahamas, ii. (1754), p. 66.

¶ McCulloch, Dict. Commerce (1834), p. 768.

short tons, value $1,312,000, or an increase in this dye-stuff alone of 32 per cent. over the production of 1909.* It may be safe to say that equal activity in the use of this wood is being displayed at home and supplies should be readily obtainable from our own Colonies of Jamaica, British Honduras, Bahamas, etc.

Haematoxylon campechianum is one of the few trees yielding a dyewood that it would appear profitable to cultivate, though *Haematoxylon Brasiletto* and *Caesalpinia Sappan*, as yielding "Brazil woods," may be worthy of some further trade development.

The Logwood tree is easily raised from seed and the cultivation is simple, the growth rapid and in favourable situations it spreads so quickly as to become naturalised, as in Jamaica, and thinning and cutting are about all the attention required. In any event, started on waste land it might prove a safe speculation for feeding bees and the production of honey. Provided the temperature is tropical with a good rainfall, soil would seem to be of secondary consideration, though Dampier, whose description of the tree and its native surroundings† is given below, says it will not thrive in dry ground. His information otherwise, however, is of special interest to possible cultivators as being probably the most complete account of the natural conditions under which the tree originally grew. It is also important to remember that "Bastard Logwood"‡—of no value for dyeing purposes—is produced by trees growing side by side with those yielding valuable wood, and the cause of this difference has not yet been determined. No botanical differences have been observed, but if the cause be due to some climatic or soil condition, it is well to know the conditions under which the trees will thrive. Experiments have been started (1903) in Botanical Gardens of Jamaica and New York with seedlings of trees producing normal and abnormal wood in order to try and find out the cause of this variation.

"This part of the bay of Campeachy lies in about 18 deg. of North Lat. . . The dry season begins in September and holds till April or May; then comes in the wet season which begins with tornados. . . . The land near the sea or the lagunes is mangrovy, and always wet, but at a little distance from it is flat and firm and never overflowed, but in the wet season. The soil is a strong yellowish clay, the upper coat or surface is a black mold tho' not deep. Here grow divers sorts of trees of no great bulk nor weight. Among these the logwood trees thrive best, and are very plentiful; this being the most proper soil for them; for they do not thrive in dry ground, neither will you see any growing in rich black mould. They are much like our white thorns in England, but generally a great deal bigger; the rind of the young growing branches is white and smooth, with some prickles shooting forth here and there; so that an Englishman not knowing the difference would take them for white thorns, but the body and the old branches are blackish; the rind rougher with few or no prickles. The leaves are small

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* Commerce Report, Washington, No. 102, 1916, May 1st, p. 407.
† Voy. and Advent., i. (1769), pp. 57–59.
‡ See Mr. Boodle's remarks on the Museum specimens under *H. Brasiletto*.

and shaped like the common white thorn leaf, of a palish green. We always chuse to cut the old black-rinded trees, for these have less sap, and require but little pains to chip or cut. The sap is white, and the heart red; the heart is used much for dyeing, therefore we chip off all the white sap till we come to the heart; and then it is fit to be transported to Europe. After it has been chip'd a little while, it turns black; and if it lies in the water it dyes it like ink, and sometimes has been used to write with. Some trees are five or six feet in circumference; these we can scarce cut into logs small enough for a man's burden, without great labour, and therefore are forced to blow them up. It is a very ponderous sort of wood, and burns very well, making a clear strong fire, and very lasting. We always harden the steels of our fire-arms when they are faulty, in a log-wood fire, if we can get it, but otherways as I said before, with Burton-wood or the grape tree. The true logwood, I think, grows only in this country of Yucatan, and even there, but only in some places near the sea. The chief places for it are either here or at Cape Catoche, and on the south side of Yucatan in the Bay of Honduras."

Some further particulars with references to illustrations and to the literature on this tree are given in *Kew Bull.* Add. Series ix., part 2, 1911, pp. 253-255.

Other woods that have been called "brazil" or "brasiletto" at various times, but which appear to deserve no more than passing mention are: *Condalia obovata*, Hook.* (*Rhamnaceae*), known as "brasil" and "logwood," "bluewood" and "purple haw," native of New Mexico, Western Texas, etc., where it is said to be one of the common "chaparral" plants, forming dense impenetrable thickets. A specimen of the wood in the Kew Museum shows no colour. *Comocladia dentata*, Jacq.† (*Anacardiaceae*), "bastard brazil," native of Cuba, St. Domingo; wood dark red, said to dye like brazil wood; juice dyes the skin black. *Comocladia ilicifolia*, Sw.‡ "St. Domingo braziletto," said to be used in dyeing, juice staining the skin black. *Trichilia spondioides*, Swartz§ (*Meliaceae*), "bastard brazil," Jamaica and Hispaniola; wood said to be used in dyeing. *Caesalpinia bijuga*, Swartz‖ (referred to *C. vesicaria*, Linn., see below), "bastard Nicaragua wood," brown, dyes red. *Caesalpinia vesicaria*, Linn.,¶ "palo campeche," Cuba (Wright), "Palo negro" Cuba (Eggers), "bastard Nicarago" or "Indian Savin Tree," Jamaica (P. Browne), "brésillet à vessies" (Lamarck), native of Cuba, Campeachy, Yucatan, Jamaica, etc. *Erythroxylum ovatum*, Cav.** (*Lineae*), "brésillette St. Barthèlemy," a shrub or tree, native of Antigua, Dominica, Mar-

* Coulter, Contr. U.S. Nat. Herb. ii. No. 1, 1891, p. 58; Sargent, Sylv. N. Amer. ii. p. 25; Pringle, Garden and Forest, ii. p. 393, who states that the wood dyes blue.

† Redwood, Suppl. Pharmacopœia (London, 1857), p. 258.

‡ l.c. p. 259.

§ l.c. p. 241.

‖ l.c. p. 268.

¶ Urban, Symbol. Antilles, ii. (1900–01), p. 283.

** l.c. v. p. 208.

tinique, St. Lucia, etc. *Caesalpinia Rugeliana*, Urban (*C. crista*, A. Rich.),* "brasilete colorado," a thorny shrub, native of Cuba.

List of Pods Illustrated in the Text.

Figs. 1–3, p. 213; Figs. 4–8, p. 217.

Fig. 1. *Caesalpinia Sappan*, outlined from specimens in Museum, from Pegu (Dr. McClelland); *a*, closed pod; *b*, open half of pod.
Fig. 2. *Caesalpinia echinata*, copied from Martius, Fl. Bras. xv. part 2, t. 22; *a*, closed pod; *b*, open pod.
Fig. 3. *Caesalpinia brasiliensis*, copied from Plumier, Nova Pl. Amer. Genera (Paris, 1703), t. 9; *a*, closed pod; *b*, part of open pod.
Fig. 4. *Caesalpinia bahamensis*, specimen in Herbarium from the Bahamas (Britton and Millspaugh, No. 2883).
Fig. 5. *Caesalpinia bicolor*, specimen in Herbarium from Colombia (R. B. White, 1895).
Fig. 6. *Peltophorum brasiliense*, specimen in Herbarium from Jamaica (Harris, No. 5439, 1894).
Fig. 7. *Haematoxylon Brasiletto*, specimen in Herbarium from S. W. Chihuahua, Mexico (Dr. E. Palmer, 1885).
Fig. 8. *Haematoxylon campechianum*, specimen in Herbarium from Trinidad (A. Fendler, No. 349, 1877–80).

XLI.—NOTE ON A BOTRYTIS DISEASE OF FIG TREES.

Studies from the Pathological Laboratory: III.

William B. Brierley.

(With Plates.)

One of the most common diseases to which fig trees in this country are subject is a "fruit" rot due to the fungus *Botrytis cinerea*, Pers. This is described by Massee as follows (Massee, G. "Diseases of Cultivated Plants and Trees," pp. 459–460, England, 1910), "Figs grown under glass very frequently become diseased when half-ripe. The free end of the fruit presents a waterlogged appearance and finally collapses with a wet rot. The injury is caused by *Botrytis cinerea*, which eventually covers the decayed 'fruit.' I have observed that under certain conditions that figs, when becoming ripe, emit a small amount of a sweet liquid through the pore at the apex of the 'fruit.' *Botrytis* spores germinate readily in this liquid, the mycelium passing into the soft tissues of the fig and causing the disease."

When examining a number of fig trees growing in a garden in Mortlake it was noted that those which showed much diseased "fruit" were also affected with a die-back of the young green shoots; whilst this was practically absent from trees bearing healthy "fruit." On the dead shoots were pustules of *Botrytis* conidiophores.

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* Urban, Symbol, Antilles (1900–01), ii. p. 278.

At the time only a few somewhat casual observations on this disease were made.

By means of a penknife blade *Botrytis* conidia were transferred to the apical pore of six figs of almost mature size. Of these, three were inoculated with spores from a dead shoot, and three with spores from a diseased "fruit"; the knife blade being sterilised in a match flame between each transfer. The conidia were placed in the pore, which was dry, and care was taken to avoid injury. A fortnight later all the inoculated "fruits" were diseased, whilst no other figs on this tree were found affected.

In a similar manner spores were transferred from diseased "fruit" and dead shoots to living shoots and placed in excisions made in the twig, in leaf axils, and in the apical bud. Other shoots were similarly cut but not inoculated, to remain as checks. Conidia were also placed on the unwounded surfaces of healthy shoots. In every case where spores were inserted in a wound the shoots were killed, and pustules of *Botrytis* conidiophores were formed. On the other hand shoots which had been merely wounded, or inoculated on unwounded surfaces, remained perfectly healthy. In all these experiments no differences could be observed in the results, which might indicate that two species or strains of the fungus were present.

The experimental figs and shoots were examined, and, with the exception of one shoot, *Botrytis* mycelium only was present in the tissues. The one exception gave rise to the fructifications of a species of *Tubercularia*.*

Subsequently a large series of inoculation experiments with pure cultures of the fungus derived from Southampton and Mortlake were commenced and are now in process of completion. The detailed results of this investigation will be published in a later communication, but it may be stated that the results already obtained confirm those of the preliminary experiments.

Growth in Pure Culture.—The fungus grows profusely on most media, its form approximating to that of *Botrytis cinerea*, Pers., although like all species of *Botrytis*, it shows very considerable variation in size of conidiophore and spore, and in the

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* This fungus is commonly found on dead shoots of Ficus carica, but as fig trees often show old dead branches bearing Nectria cinnabarina, Fries., the Tubercularia was at first merely attributed to the conidial stage of this fungus. On examination it proved to be different, and also appeared to be distinct from Tubercularia nigricans, Bull. (Lindau in "Rabenhorst's Kryptogamen Flora," Bd. I., Abt IX., p. 426) and Tubercularia atra. Passer (Passer in Rendic. Acc. Lincei Roma IV., 2 sem. p. 105 (1888)), both of which have been recorded upon dead shoots of fig trees. Edgerton (Phytopath. Vol. I., No. I. p. 12 (1911)), has described a canker of fig trees due to a fungus which he has named "Tubercularia Fici" and which is characterised by setae scattered through the sporodochia. The present Tubercularia lacks such setae and kills the shoot without any canker formation. Frequently the Tubercularia follows the Botrytis disease as a saprophyte, but inoculation experiments carried out with pure cultures of the fungus have shown that it can function as an aggressive parasite, usually gaining admittance to the shoot through the fruit scars. Further observations on this disease are being made.

diameter of the hyphae. Cultures have been made from diseased "fruit" and shoots obtained from trees in Mortlake, Kew and Southampton, but no constant differences can be detected. After a varying period of time abundant sclerotia are formed, which arise in an irregular manner and project above the surface of the medium. They are jet black in colour, somewhat nodular in form, and vary in size from a mere point to bodies with a diameter of two or three millimetres. On germination, which usually follows after a considerable resting period, they give rise always to *Botrytis* conidiophores.

When growing in culture media the fungus is characterised by the very profuse development of "haptera" which assume an olive-green to grey-black colour.

A detailed comparative study of the physical and chemical relations of the fungus, and the conditions of its virulence is in progress, and will form part of the full paper.

The Disease on the "Fruit."—Infection may occur at any point, but usually the attack commences at the pore, and thence rapidly spreads until the entire "fruit" is enveloped in a grey mould of *Botrytis* conidiophores (Plate IX., figs. 1–4). The advancing edge of the disease is marked by a brown or purplish line behind which the tissues are sodden and discoloured. At a distance of about ten to twenty millimetres away from the healthy tissues the fungus conidiophores appear (Plate IX., fig. 2). At first these are pure white, but rapidly turn to a dull grey. If a diseased "fruit," be cut open it will be found that the central cavity is usually free from mycelium. The fungal hyphae penetrate the tissues in all directions causing a partial solution of the cell walls and a collapse of the cells; and advance with great rapidity.

By the time the fig is completely enveloped it has shrunk considerably in size, and after a few weeks shrivels to a mummified condition (Plate IX., figs. 3 and 4; Plate VIII., fig. 3). In this state it often hangs on the tree during the winter, and the following spring and early summer gives rise to abundant conidiophores.

The latter arise in clusters from irregular sclerotial masses of hyphae which frequently give the mummified "fruit" a nodular and very irregular shape. Externally the sclerotia are greyish-black, but are cream coloured in section and glisten slightly when freshly cut. They are soft, and cheese-like of texture.

Conidia taken from such "mummies" which had overwintered on the tree, proved readily capable of reproducing the disease on both shoot and "fruit."

On trees which are badly diseased these mummified "fruits" are found in great abundance, and on one such tree trained against a wall 83 were counted.

Die-back of the Shoots.—When a shoot is inoculated the mycelium at first tends to spread equally in all directions, and rapidly encircles the shoot. It then slowly progresses upwards in the tissues and more rapidly downwards. The shoot above the diseased area soon dies and usually becomes shrivelled and

brown (Plate VIII., figs. 1–3). The growth of the mycelium appears to be confined to the one season so that it does not advance from the dead shoot further into the tree the following year.

The mycelium is chiefly found in the cortex of the shoots and the hyphae are stout and freely branched, penetrating the tissues rapidly in all directions. They do not appear to exert the same destructive action upon the cell walls as was noted in the fruit, but the cells are killed and collapse.

At different levels in the cortex loose aggregations of hyphae are formed, which become more solid as they reach the periphery. These rupture the epidermis and appear as numerous pustules of a greyish-brown colour from which arise the conidiophores. The latter are somewhat stout and thick and the conidia large.

In certain of the shoots, but not perhaps in a majority, the fungus remains alive during the winter and gives rise to successive crops of conidia the following year. Such conidia are capable of reproducing the disease when inoculated into shoots and "fruits."

Control Measures.—It is evident that the fungus is carried over the winter in the mummified "fruits" and dead shoots; and therefore that any treatment must be based on the elimination of these two sources of infection. Careful attention to this is all that appears to be necessary; for badly diseased trees which have been so treated have entirely recovered and now bear healthy and full crops.

Explanation of Plates VIII. and IX.

Plate VIII.—Fig. 1. Shoot inoculated at X and killed by the fungus which has progressed down the shoot to Y. The figs were unable to develop and dried up to the condition shown. Undeveloped figs which may result from many causes must not be confused with the mummified "fruits" resulting from the attack of the fungus, and may be distinguished by the fact that they are smooth and without the irregular nodular form of the "mummies," are usually greenish-brown in colour and are free from fungus.

Figure about one-half natural size.

Fig. 2. Shoot inoculated at apex X and killed, the fungus penetrating down the shoot to Y. The uppermost lateral buds which develop the following season usually give rise to primitive leaves.

Figure about two-thirds natural size.

Fig. 3. Fig inoculated at the pore X. The fungus enveloped the "fruit" and passed down the stalk into the shoot which it killed as far as Y. The fig is a true mummy resulting from fungal attack.

Figure about one-third natural size.

In all these cases the conidia used for inoculation were derived from pure cultures of the fungus from diseased "fruits."

Plate IX.—The "fruits" were inoculated when almost fully grown and five days after each other, *i.e.*, figure 4 on June 5th, and figure 1 on June 20th. On June 25th they were gathered

[*To face page* 228.

To face page 229.]

and photographed. The spores used for inoculation were from pure cultures of the fungus on the shoot, and in each case they were placed in the pore of the "fruits."

Fig. 1. The tissues for about 1·5 cm. diameter around the pore are discoloured and slightly depressed, and conidiophores are beginning to develop on the surface.

Fig. 2. About one-half the "fruit" is diseased, and 10 mm. to 15 mm. behind the advancing edge which is here clearly visible at X, the diseased tissues are covered by fungus conidiophores. The collapse of the tissues is apparent in the altered size and shape of the fig.

Fig. 3. The entire "fruit" is enveloped by the conidiophores of the fungus and further shrinkage has occurred.

Fig. 4. The fig is shrivelling to a mummified condition.

XLII.—DIAGNOSES AFRICANAE: LXIX.

1601. **Macrolobium elongatum,** *Hutchinson* [Leguminosae-Amherstieae]; affinis *M. Heudelotii*, Planch., sed foliis abrupte acuminatis infra laxe reticulatis, inflorescentiae ramis longioribus, alabastris floribusque multo majoribus differt.

Arbor parva, ramosa; ramuli ultimi valde flexuosi, lenticellis minutis numerosis instructi, ceterum glabri, parum complanati. *Folia* paripinnata, petiolo communi usque ad 6 cm. longo; foliola 2-juga, breviter petiolulata, elliptica vel ovato-elliptica, abrupte obtuse acuminata, basi rotundata vel rarius subcuneata, 7-14 cm. longa, 4·5-6 cm. lata, firme chartacea, utrinque glabra et nitidula, laxe reticulata; nervi laterales utrinsecus circiter 6, arcuati, intra marginem conjuncti, infra prominentes; petioluli crassi, transverse rugosi, 4-5 mm. longi. *Stipulae* persistentes, subfoliaceae, oblanceolatae vel elliptico-oblanceolatae, obtusae, 5-7 mm. longae, 2-3 mm. latae, nervosae, glabrae. *Paniculae* racemiformes, elongatae, usque ad 30 cm. longae, ubique minute puberulae; rami demum reflexi, ad 5 cm. longi; ramuli ultimi circiter 0·5 cm. longi, pauciflori; pedicelli 4-5 mm. longi, puberuli. *Alabastra* bracteolis involucrata, obovoidea, 1 cm. longa. *Bracteolae* 2, oppositae, obovatae, apice rotundatae, minute tomentellae. *Receptaculum* tubulosum, 3 mm. longum, glabrum. *Sepala* 4, oblonga, obtusa, 6 mm. longa, 3 mm. lata, glabra. *Petala* sepalis multo longiora, obovato-oblanceolata, glabra. *Filamenta* glabra. *Ovarium* dense brunneo-tomentosum.

Tropical Africa. Sierra Leone: Pujahun, Feb., *Lane-Poole* 161.

1602. **Cotyledon fusiformis,** *Rolfe* [Crassulaceae]; affinis *C. mamillari*, Linn. f., sed foliis basi angustioribus, calycis lobis acuminatis, et colore florum differt.

Caulis erectus, sublignosus, brunneo-striatus, circiter 20 cm. altus, foliatus. *Folia* subfusiformia, crassa, subobtusa, glauca, minutissime puncticulata, 5–7 cm. longa, 1–1·2 cm. lata, basi attenuata. *Scapus* terminalis, suberectus, circiter 10 cm. longus,

parce ramosus, pauci vel pluriflorus. *Flores* solitarii, brevissime pedicellati, subhorizontales. *Bracteolae* ovatae, minutae. *Calyx* 2 mm. longus; lobi subulati, acuminati, 1 mm. longi. *Corolla* 1·2 cm. longa; tubus cylindricus, pallide viridis; lobi recurvi, ovati, acuminati, albi, apice pallide purpurei, 2 mm. longi. *Stamina* tubo corollae adnata, exteriora circiter 9 mm. longa, interiora 7 mm. longa. *Carpidia* gracilia, circiter 1·1 cm. longa; styli subgraciles.

South Africa. Without precise locality, *H. H. W. Pearson*, 5585. (Percy Sladen Memorial Expedition.)

Flowered at Kew in July, 1916. Nothing like this plant is recorded in Schönland's account of the *Crassulaceae* collected during the expedition, possibly because the plant may have been collected out of flower, and consequently no dried specimens preserved. It is very nearly allied to *C. mamillaris*, Linn. f., which is very imperfectly represented in the Herbarium, but which, according to the Botanical Magazine figure (t. 6020) has the lobes of the corolla dark red-purple and the tube yellow, while in the present one the lobes are white with pink tips, and the tube very pale green. There are also other differences which prevent our plant from being referred to *C. mamillaris*.

1603. **Dissotis Lambii,** *Hutchinson* [Melastomaceae-Osbeckieae]; affinis *D. grandiflorae*, Benth., sed caulibus parce setulosis, foliis multo majoribus breviter appresse setulosis, staminibus longioribus differt.

Caulis 1·25–1·5 m. altus, erectus, simplex vel subsimplex, basin versus foliatus, superne nudus, parce setulosus vel setosus, internodiis elongatis. *Folia* elongato-lanceolata, acuta, basi subobtusa, 10-12 cm. longa, 1-2·5 cm. lata, setoso-ciliata, ciliis ascendentibus 1·5-2 mm. longis, conspicue trinervia, utrinque breviter appresse setulosa, nervis supra impressis infra prominentibus; petioli 3–5 mm. longi, longe setosi. *Flores* magni, in paniculam terminalem circiter 30 cm. longam et 20 cm. latam dispositi; rami usque ad 10 cm. longi, angulares, in angulis setulosi; pedicelli ultimi basi longe setosi, circiter 0·5 cm. longi. *Receptaculum* primum cylindricum, demum campanulatum, fere 1 cm. longum, squamis semiorbicularibus longissime setosis obtectum. *Calycis* segmenta mox decidua, oblongo-lanceolata, 1 cm. longa, 2–3 mm. lata, minute ciliata, apice pilis longe setosis stramineis 3–5 instructa. *Petala* 5, obovata, circiter 4 cm. longa, usque ad 3 cm. lata, glabra. *Stamina* valde inaequalia, breviora 2 cm. longa, longiora 4 cm. longa; antherae circiter 1 cm. longae. *Stylus* gracilis, 3·5 cm. longus, glaber.

Tropical Africa. Nigeria: Northern Provinces; Kaduna, Oct., *Lamb* 58.

This is a very fine species allied to *D. grandiflora*, Benth., from Senegambia and Sierra Leone, but with much larger leaves and big handsome flowers.

1604. **Nesaea** (§ **Salicastrum**) **hispidula,** *Rolfe* [Lythrarieae]; inter species africanas adhuc descriptas ramulis foliisque pilis hispidulis copiose vestitis facile distinguenda.

Fruticulus perennis, ramosissimus, 30–60 cm. altus. *Ramuli* subteretes, copiose cinereo-hispiduli. *Folia alterna*, numerosa, sessilia, linearia, subacuta, 0·8–1·2 cm. longa, copiose cinereo-hispidula, pilis patentibus, basi subsagittata, margine revoluto. *Cymae* axillares, breves, subcapitatae, pauciflorae. *Bracteae* lanceolato-oblongae, subobtusae, 1 mm. longae. *Pedicelli* 1·5–2 mm. longi. *Calyx* campanulatus, hispidulus, 3–3·5 cm. longus; lobi ovati, acuti, circiter 1 mm. longi. *Petala* obovata, circiter 3 mm. longa, rosea. *Stamina* 0·6 cm. longa. *Stylus* 0·8 cm. longus.

Tropical Africa. British East Africa: at Nairobi, *A. Whyte; E. Battiscombe*, 69; *W. J. Dowson* 67, 332.

1605. **Odontospermum lanzarotense,** *Hutchinson* [Compositae-Inuloideae]; species subacaulis, foliis dense confertis dentatis breviter hispidis capitulis magnis distincta.

Planta humilis, subacaulis, usque ad 5 cm. alta, basi lignosa. *Folia* conferta, subrosulata, longe petiolata, spatulato-obovata, apice obtusa, petiolo incluso 2–3·5 cm. longa, 0·6–1·3 cm. lata, superne argute dentata, rigide chartacea vel subcoriacea, 1-nervia, utrinque et margine breviter hispida. *Capitula* breviter pedunculata, circiter 3 cm. expansa, pedunculis usque ad apicem foliis paucis anguste oblancealotis instructis. *Involucri bracteae* 3–4-seriatae, lineares vel lineari-lanceolatae, apice acutissimae, circiter 1 cm. longae, rigide coriaceae, extra dense appresse pilosae. *Receptaculum* planum, rigide paleaceum, paleis subulato-lanceolatis acutissimis 5 mm. longis marginibus membranaceis minute ciliolatis. *Flores radii* numerosi; corollae tubus angustissimus, 2 mm. longus, glaber; limbus oblongo-lanceolatus, apice acute trifidus, circiter 1·4 cm. longus, 2·5 mm. latus, basin versus 4-nervius, superne 6-nervius. *Flores disci* numerosi; corollae tubus inferne angustissimus, superne leviter sensim ampliatus, glaber, 4 mm. longus; lobi 5, lineari-lanceolati, acuti, 1·5 mm. longi, glabri. *Achaenia* (immatura) 1·5 mm. longa, parce puberula. *Pappi* squamae 0·75 mm. longae, apice denticulatae.

Canary Islands. Lanzarote, March, *Rev. R. T. Lowe.*

1606. **Thesium cruciatum,** *A. W. Hill* [Santalaceae]; species *T. hystricoidei*, A. W. Hill, habitu similis sed *T. lacinulato*, A. W. Hill, arcte affinis, a quae floribus glabris, lacinulis undulatis antherisque majoribus praecipue differt.

Suffrutex perennis circiter 30 cm. altus; rhizoma crassum lignosum, ramis et ramulis rigidis apice spinosis indumento minutissimo puberulo obtectis cortice longitudinaliter ruguloso. *Folia* squamiformia, subulata, acuta vel acuminata, ramis appressa, 1–2 mm. longa, apice fusca, glabra. *Flores* axillares, pedicellati, ad ramulorum bases congregati; bracteae et bracteolae squamiformes, minutae. *Perianthium* 2 mm. longum, extra glabrum glandulis externis ovoideis instructum, segmentis 1 mm. longis ovatis subacutis erectis cucullatis marginibus lacinulis membranaceis undulatis antheras amplectantibus

instructis. *Antherae* 0·65–0·75 mm. longae, exsertae, filamentis 0·5 mm. longis. *Stylus* crassus, 0·5 mm. longus. *Fructus* immaturus, costatus, glaber.

South-West African Protectorate. Plains South of Choaberib (6–1–16), *H. H. W. Pearson* 9447; sandy Plains north of Areb (5–1–16), *H. H. W. Pearson* 9474.

This species collected by Prof. Pearson on his recent Percy Sladen Memorial Expedition (1915–16) to Keetmanshoop-Ababies-Windhoek, closely resembles *T. Hystrix*, A. W. Hill and *T. hystricoides* in its general spinous habit and wrinkled cortex. The flowers, however bear undulate lacinulae on the perianth segments which more or less enfold the anthers, and the nearest ally of this plant is no doubt *T. lacinulatum*, A. W. Hill, collected by Prof. Pearson in the Great Karasberg.

In the key to the species of *Thesium* given in the *Flora Capensis* it should be placed next to *T. lacinulatum*.

1607. **Ficus Burtt-Davyi,** *Hutchinson* [Moraceae]; affinis *F. natalensi*, Hochst., sed foliis ellipticis vel oblongo-ellipticis nervis lateralibus plerumque 5, ostiolo parvo vix umbonato differt.

Frutex vel arbor parva; rami cortice cinereo obtecti, juniores minute et molliter puberuli. *Folia* elliptica vel oblongo-elliptica, utrinque rotundata vel apice leviter acuminata, 2·5–6·5 cm. longa, 1–4·5 cm. lata, tenuiter chartacea, utrinque glabra; costa ad laminae apicem sensim angustata, infra subprominens; nervi laterales utrinsecus circiter 5, intra marginem multi-ramosi, infra distincti et leviter prominentes; venae delicate reticulatim anastomosantes; petioli circiter 1 cm. longi, glabri; stipulae caducae, acuminatae, usque ad 2·5 cm. longae, submembranaceae, rubro-brunneae et glabrae. *Receptacula* axillaria, plerumque geminata, pedunculata, subglobosa, 0·7–1 cm. diametro, minute puberula vel fere glabra; pedunculi 2–6 mm. longi, puberuli. *Bracteae basales* submembranaceae, basi connatae, tenuiter puberulae. *Ostiolum* bilabiatum, hians; bracteae in receptacula descendentes. *Flores* ♂ perianthio membranaceo et stamine solitario.—*F. natalensis*, Mildbr. et Burret in Engl. Bot. Jahrb. xlvi. 255, non Hochst. *F. natalensis*, var. *pedunculata*, Sim, For. Fl. Port. E. Afr. 98.

South Africa. Coast Region: Riversdale Div.; near Gauritz River Bridge, *Galpin* 4579 Knysna Div.; in the forest near the quarry at Knysna, *Burchell* 5412. Uitenhage Div.; near Enon, *Drège a.* Port Elizabeth Div.; near the burial ground at Port Elizabeth, Burchell 4306; Valley near Port Elizabeth, *Paterson;* Krakakamma, *Zeyher* 557. Bathurst Div.; between Riet Fontein and the sea shore, *Burchell* 4112; between Port Alfred and Kaffir Drift, *Burchell* 3851. Queenstown Div.; Zwart Kei River, Junction Farm, *Galpin* 8172. Glen Grey Div.; White Kei Falls, *Galpin* 2507. Albany Div.; on the rocks of Zwartwarter Poort, *Burchell* 3411; Koure West, *Burtt-Davy* 7954; Howison's Poort, *Salisbury* 440 a; Alicedale Poort, *Salisbury* 440: East London Div.; Cove Rock, *Galpin* 3104.

Komgha Div.; in woods near Komgha, *Flanagan in MacOwan Herb. Austr. Afr.* 1531.

Central Region: Graaff Reinet Div.; mountains near Graaff Reinet, 1400 m., *Bolus* 711.

Eastern Region: Transkei Div.; Kentani forests, *Pegler* 1125, 1342. Natal; Durban, *Cooper* 3159; *Burtt-Davy in Herb. Wood* 12845, 12874; Maritzburg, *Sim*, 7123; Dumisa Station, *Rudatis* 1144; without precise locality, *Sanderson*.

In herbaria this species will be found with *F. natalensis*, Hochst., with which it has been confused; it may be readily separated by the rounded (not stipitate) base of the receptacle, smaller ostiole, and differently shaped leaves with delicate reticulation.

1608. **Thuranthos,** *C. H. Wright* [Liliaceae-Scilleae]; genus novum ex affinitate *Drimiae*, Jacq., a qua perianthii segmentis liberis bulboque squamato differt; ab *Albuca*, Linn., perianthii segmentis homomorphis, interioribus non conniventibus bulboque squamato distinguitur.

Bulbus squamis crassis carnosis instructus. *Folia* hysterantha, radicalia, linearia. *Flores* racemosim dispositi; pedicelli sub anthesi decurvati, postea erecti; bracteae parvae. *Perianthii* segmenta 6, aequalia, uninervia, reflexa. *Stamina* 6; filamentorum duae partes inferiores compressae, valide incurvatae, tertia pars superior cylindrica, erecta; antherae oblongae, dorsifixae. *Ovarium* trilobatum, triloculare; stylus columnaris; stigma discoideum; ovula plura.

T. macranthum, *C. H. Wright*, species unicum.—*Drimia? macrantha*, Baker in Engl. Bot. Jahrb. xv. Heft 3, p. 7, and in This.-Dyer, Fl. Cap. vi. p. 442. *Ornithogalum? macranthum*, Baker in Journ. Linn. Soc. xiii. 280.

South Africa. Coast Region: Uitenhage Div.; Van Stadens River, below 200 ft., *Drège* 2204. Queenstown Div.; flats by the Zwart Kei River, 4000 ft., *Drège* 3531. East London; between Gonubie and Kwelegha Rivers, 300 ft., *Galpin* 5812. Komgha Div.; damp valleys between Komgha and the mouth of the Kei River, 1500 ft., *Flanagan* 468.

Eastern Region: Transkei; valleys, 1200 ft., *Miss Pegler* 79. Tembuland; Umtata, *G. E. & Miss M. H. Mason*. Griqualand East; river banks near Kokstad, *Haygarth in Herb. Wood*. 4211.

This plant is so different from the genera into which it has been doubtfully placed that it merits raising to generic rank. It differs from *Drimia* in the absence of a campanulate perianth-tube, and from *Ornithogalum* in its scaly bulb (like that of some lilies) and in the perianth-segments having a 1-nerved midrib. It is more closely allied to *Albuca*, which differs in having the inner perianth-segments erect and shorter than the outer, as well as in the different structure of the filaments. In *Thuranthos* the lower two-thirds of the filaments are coloured like the perianth, flattened, incurved nearly a quarter of a circle and connivent above, thus resembling some paper lanterns with longitudinal interstices. The upper parts of the filaments are white,

cylindrical, and stand erect around the columnar style. The flowers are sweet-scented and open suddenly in the late afternoon or evening.

The generic name is derived from *θυρα*, an opening, and *ανθος*, a flower, in allusion to the interspaces between the lower parts of the filaments.

1609. **Coelorhachis capensis,** *Stapf* [Gramineae § Andropogoneae]; affinis *C. afrauritae*, Stapf, sed racemis perpaucis solitariis robustioribus, pedicellorum auriculo minuto, spiculis sessilibus majoribus, pedicellatis neutris saepe ad glumas reductis diversa.

Gramen perenne, glaberrimum, dense caespitosum, innovationibus intravaginalibus. *Culmi* 25–30 cm. alti, circiter 3-nodi, erecti, inferne lateraliter compressi, e nodis ramosi, ramis solitariis. *Foliorum* vaginae glabrae, dense striato-nervosae, inferiores lateraliter admodum compressae, 5–12 cm. longae; ligulae breves, truncatae, minutissime ciliolatae; laminae lineares, acutae, basi sensim in vaginam abeuntes, arcte plicatae, ad 20 cm. longae, explicatae ad 12 mm. latae, firmulae, saepe tortae, rubescentes, praeter apices scaberulos laeves, acute carinatae, nervis numerosis arctis tenuibus. *Racemi* spiciformes terminales et axillares, 2–3, solitarii, remoti, terminales tandem e vagina aphylla vel subaphylla exserti, subcylindrici, recti vel curvati, flavido-virescentes, ad 7 cm. (vel ultra?) longi, 2–3 mm. diametro; articuli superne clavato-cuneati, inferne lineares et a dorso valde compressi, apice excavato, in dorso nervoso-striati, 4 mm. longi, exappendiculati; pedicelli articulis aequilongi et paralleli, ab iis distantes, anguste lineares, apice ex angulo articulo approximato minute dentato-auriculati. *Spiculae sessiles* oblongae, obtusae, 4·5 mm. longae, a dorso compressae, basi transverse admodum constrictae, callo brevi cum pedicelli et articuli basibus in annulum confluente. *Glumae* subaequales, inferior coriacea, dorso applanata, laevis, carinis superne anguste alatis, alis apice conjunctis, nervis intracarinalibus 5 extus plane obscuris; superior subacuta, acute plicato-carinata, 3-nervis. *Valva* anthoecii inferioris glumam superiorem subaequans, subacuta, hyalina, 2-nervis, vacua, anthoecii superioris late oblonga, obtusa, 3·5–4 mm. longa, tenuiter membranacea, 3-nervis, cum valvula aequilonga et simillima nisi 2-nervi. *Spiculae pedicellatae* sessilibus similes, sed minores 2–4 mm. longae, neutrae, saepe ad glumas reductae, quarum inferior uno tantum latere alato-carinata et leviter nervoso-striata.

South Africa. Coast Region: Stutterheim Div.; Fort Cunninghame, *Sim* 2733.

The type may be found in the collections of the British Museum.

1610. **Schismus pleuropogon,** *Stapf* [Gramineae § Festuceae]; affinis *S. aristulato*, Stapf, sed duratione, glumarum nervis paucioribus, valvis acuminatis tenuiter nervosis ad latera tantum pilosis, antheris minoribus distinctus.

Gramen perenne, caespitosum, circiter 15 cm. altum. *Culmi* geniculato-erecti, graciles, 2–3-nodi, internodiis superioribus e vagina exsertis. *Foliorum* vaginae laevissimae, glaberrimae, nervoso-striatae; ligulae ad lineam ciliolatam reductae; laminae setaceo-involutae, subacutae, ad 5 cm. longae, explanatae 1–1·5 mm. latae, firmulae, laeves, glabrae, utrinque nervis 3–5. *Panicula* spiciformis, 2–2·5 cm. longa, anguste oblonga, ramis ramulisque scabriusculis. *Spiculae* 3–4 mm. longae, breviter vel brevissime pedicellatae. *Glumae* subaequales, a latere visae lanceolatae,, acutae vel acutissimae, spicula paulo breviores, 3- vel (inferior) sub-4-nerves, margine scarioso latiusculo. *Valvae* a latere visae oblique lanceolatae, acuminatae, 2·5 mm. longae, e sinu mucronulatae (anthoeciorum inferiorum) vel aristulatae aristula ad 1 mm. longa, nervis 9 lateralibus interioribus basin versus tenuissimis extimo magis conspicuo, margine ad medium dense barbato pilis subacutis, dorso glaberrimo. *Paleae* valvas subaequantes, glabrae vel subglabrae. *Antherae* 0·6 mm. longae.

South Africa. Coast Region: Riversdale Div.; in moist places near Riversdale, 130 m., *Schlechter* 1759.

XLIII.—PODOCARPUS THUNBERGII—NOMENCLATURE.

The following correspondence has passed between the Chief, Division of Botany, Department of Agriculture, Pretoria and the Director, Royal Botanic Gardens, Kew:—

Sir,

Botanical Nomenclature.

I have the honour to enclose with this some correspondence with the Research Officer of the Forestry Department of the Union of South Africa.

I should be glad if you would give a ruling in this matter. The changing of well-known and much used scientific names, especially in the case of economic plants, is always fraught with confusion and dissatisfaction in the lay mind, and I am personally in favour of keeping up the name *Podocarpus Thunbergii* if it is possible to do so. I have not, however, the literature at my disposal to enable me to decide the question of priority of nomenclature in this case and should be glad to have your opinion on the matter.

I am, etc.,

I. B. Pole Evans,
Chief, Division of Botany.

Sir,

I have the honour to acknowledge receipt of your letter No. P. 44/6, dated 18th August last, on the subject of botanical nomenclature, and in reply to the specific question raised I take pleasure in enclosing a memorandum in which

the facts of the case are detailed. This may, I hope, enable you to come to a decision as to the course which it is desirable to adopt in the use of a name for the South African *Podocarpus* under reference.

I am, etc.,

D. Prain,
Director.

Podocarpus Thunbergii (Nomenclature).

The tree in question was originally called *Taxus latifolia* by Thunberg, Prod. Fl. Cap. (1794–1800) 117. R. Brown recognised it as a *Podocarpus* in 1825 (see Mirb. Geogr. Conif. in Mem. Mus. XIII. 75) and called it correctly *Podocarpus latifolia*, the name applying exclusively to a well-known South African tree. There is so far no ambiguity of the name. In 1830, however, Wallich described a totally different Indian tree as *Podocarpus latifolia*, evidently unaware of R. Brown having already formed the combination. In 1838 Bennet in Pl. Jav. rar. 40 repeated Brown's combination for the Cape tree; but he also admitted Wallich's identical name for the Indian Conifer on p. 94, quite aware of the contradiction, but probably unwilling to give the latter a new name. Then in 1842 W. Hooker (in Lond. Journ. Bot. i. 657) seeing the necessity of a new name for one of the two "*Podocarpus latifolia*" in Bennet's synopsis and assuming that R. Brown's combination was first made there, that is in 1838, whilst Wallich's dated from 1830, gave the latter priority and renamed the African species *P. Thunbergii*. That this is so is clear from his synonymy (*P. latifolia*, Br. in Horsf. Pl. Jav. Rar. 40, non Wall.) which contains no reference to R. Brown's earlier publication quoted above. There is little doubt that neither Wallich nor Sir W. Hooker would have named the plants in question as they did had they been aware of R. Brown's name of 1825. Two years later the mistake was pointed out by C. Presl (Bot. Bemerk. 110) who restored Brown's earlier name for the Cape tree and proposed the name *P. Wallichianum* for the Indian tree. R. Brown's and C. Presl's names seem to have remained unnoticed until their re-publication in Index Kewensis in 1894, by which time the names which supplanted them had become well established in literature, *i.e.*, *P. Thunbergii* and *P. latifolia*, Wall. For that reason it might seem desirable to retain them, but there is no generally recognised rule under which this could be done, and to return to the earlier names will be the more expedient, as it is in agreement with the nomenclature of Pilger's recent monograph of *Taxaceae* in the Pflanzenreich.

I have treated "*Podocarpus*" as feminine in this memorandum, as has been done in Index Kewensis. Persoon, who first took up L'Heritier's MS. name, makes it masculine and Pilger follows him. It is a point of small consequence.

XLIV.—MISCELLANEOUS NOTES.

Gustav Mann.—We have recently learnt with deep regret of the death, in his 81st year, of Mr. Gustav Mann, which occurred at Munich on June 22nd. As Collector for Kew on Dr. Baikie's Niger Expedition in 1859, he was the first to explore botanically the mountains of W. Tropical Africa, and in particular he made valuable collections on the Cameroon Mountain. In 1863 Mann was appointed assistant in the Government Cinchona plantations, Darjiling, and in the following year became assistant Conservator of Forests, Bengal. From November, 1868, he served in the Assam Forest Service, being appointed Conservator in 1882 and retired in May, 1891. In *K.B.* 1907, p. 247, a short account of Mr. Mann's work is given in connection with the presentation of his portrait to Kew.

Lord Redesdale.—In the death of Lord Redesdale, which occurred at Batsford Park, Moreton-in-Marsh, on 17th August, Kew has to mourn the loss of an old, a sympathetic and a tried friend. This is not the place in which to speak of the long and varied public career of His Lordship, which began in 1858 when in his 21st year he entered the Foreign Office, his diplomatic service ending with his resignation in August, 1873, though it may be remarked that to his residence in Japan from September, 1866, until the summer of 1870, may, perhaps, be traced the keen interest which he took in the introduction to this country and the establishment in English gardens of bamboos from temperate latitudes and altitudes in Eastern Asia.

In 1874 Lord Redesdale (then Mr. Freeman-Mitford) was appointed by Mr. Disraeli to be Secretary to the Commission of Public Works and Buildings, a position which he held until his resignation of the post in 1886. To this period, therefore, belongs his public connection with Kew, and the formation of that attached friendship with Sir Joseph Hooker, the Director of this establishment, to which His Lordship's recently published "Memories" bear such warm testimony.

Lord Redesdale's keen and cultured interest in gardening led from the outset to a marked official sympathy with Kew which developed in its intensity with longer association and fuller appreciation of the many-sided activities of the establishment itself. Nor did this interest leave with his demission of office. On the contrary it reacted on His Lordship and to the influence of his friend Hooker may be largely attributed the preparation of the work on "The Bamboo Garden," illustrated by Mr. Alfred Parsons and published in 1896, which, besides testifying to his enthusiasm and embodying his cultural experience in the cultivation of the more temperate *Bambuseae* in England, has placed systematic students of this difficult group under no little obligation for the lucidity of his accounts and the indications of the identity and the affinities of the various species he had succeeded in growing.

Albizzia ferruginea and A. malacophylla.—In 1844 Bentham* described *Albizzia ferruginea* from two gatherings, one a flowering specimen from Gambia, collected by Leprieur, and described by Guilleman and Perrottet† as *Inga ferruginea*, the other collected in Abyssinia by Schimper and distributed under the name *Acacia malacophylla*, Steud. The latter was afterwards described by A. Richard‡ as *Inga malacophylla*, and subsequently became *Albizzia malacophylla*, Walpers. Bentham described the ovary of *A. ferruginea* as glabrous, evidently copying Guilleman and Perottet, for in Schimper's specimen the fruits are shortly and densely pubescent. In Bentham's later work§ on *Albizzia*, he added to the synonymy and remarked "the Senegambian plant being only known in flower and the Abyssinian one in fruit, their identity is perhaps not yet sufficiently established, although I can discover no character to separate them."

In 1894 Schweinfurth collected flowering specimens of the Abyssinian plant; whilst in 1912 Mr. C. C. Yates collected an example of the Senegambian species in Northern Nigeria with flowers and fruits which shows that Bentham's *A. ferruginea* includes two distinct species. Their differences and synonymy are as follows:—

Albizzia ferruginea, *Benth.* in Hook. Journ. Bot. iii. 88 (1844), et in Trans. Linn. Soc. xxx. 563 (1875), partim, excl. syn. *Acacia malacophyllam*, Steud., et *specimen Schimperianum;* Oliv. Fl. Trop. Afr. ii. 361, partim; Chevalier, Veg. Ut. Afr. Trop. Fran. v. 170 (1909), partim. *Inga ferruginea*, Guill. & Perr. Fl. Seneg. i. 236 (1833).

Folia membranaceo-chartacea, apice rotundata vel paullo emarginata; pedunculi calycis et corollae indumentum ferrugineum; ovarium et fructus glaber.

Distrib.—Senegambia: River Nunez, *Heudelot* 881; Gambia: Albreda, *Leprieur;* Tamboukane, fr. Dec., *Chevalier* 2104. Ivory Coast: Bingerville, Feb., *Chevalier* 16218. Nigeria: Northern Provinces; Agaie, fls. & fr., Feb.–March, *Yates* 14; Southern Provinces; Awka Distr., *Thomas* 74.

Mr. Yates describes the tree as being 40–60 ft. high, occurring in fringing forests; wood very hard. Chevalier records it from Bingerville 80–100 ft. high with a trunk 14–18 in. in diameter, devoid of branches for nearly 50 ft., with an umbrella-like crown; the wood is similar to *Acacia* wood, clear yellow and finely striated. Vernacular—*Sakanchi* (Yates).

Albizzia malacophylla, Walp. Ann. ii. 457 (1851–2); Fourn. in Ann. Sc. Nat. ser. IV. xiv. 376. *Inga malacophylla*, A. Rich. Fl. Abyss. i. 235, partim excl. *Schimper* 1578. *Acacia malacophylla*, Steud. ex A. Rich, l.c., nomen. *Albizzia ferruginea*, Benth. in Hook. Journ. Bot. 1844, 88, et in Trans. Linn. Soc. Bot. xxx. 563, partim; Oliv. Fl. Trop. Afr. ii. 361, partim.

Folia rigide chartacea vel subcoriacea, apice conspicue

---

* Hook. Lond. Journ. iii. 88.
† Fl. Senegam. 236 (1833).
‡ Fl. Abyss. i. 235 (1847).
§ Revis. Mimosae in Trans. Linn. Soc. xxx. 563 (1875).

mucronata; pedunculi calycis et corollae indumentum cinereum; ovarium et fructus pubescens.

Distrib.—Abyssinia: mountain plains between Chiré and Sana, fr. Nov., *Schimper*, Sect. II. 521; Amba Lake, fr. March, *Schimper* 585. Eritrea: near Mai-Mafales, in Dembelas, 1700–1900 m., fl. Mar.–Apr., *Schweinfurth* 260; 261. Uganda: Mabira Forest, 1300 m., *Dawe* 175 (timber specimen no. 16).

Mr. Dawe states that this is a timber tree 70–80 ft. high, known as *Joge*. His specimen consists of leaves only, but I have little doubt as to the determination. J. H.

The genus Phoradendron.*—The genus *Phoradendron* in the New World takes the place of *Viscum* in the Old. Most species so resemble the common mistletoe as to be mistaken for it in a winter landscape; but beneath that great general resemblance is hidden a remarkable differentiation of minor characters often difficult for the inexperienced eye to grasp, but mostly going hand in hand with a definite and frequently narrow geographical distribution. On it is based the author's admission of a great number of species, 240 in all. The number may appear excessive, but the careful scrutiny which he has applied to his subject and the concordance of his work and the results obtained by the most careful students in the same field before him, as Eichler and Urban, impress one with confidence in the soundness of his limitation of the species. A passage from his introduction (p. 17) may be quoted as characteristic of the standpoint of the author in that respect:—"In a monographic assemblage, such as is here offered, no lasting harm can come from the most radical segregation of forms possible on morphologic and geographic considerations, while on the other hand a blending of widely dissociated forms or of such as differ greatly in their extremes though without as yet definable breaks in the series, *e.g.*, *P. piperoides*, leaves the work to be taken up once more from the very foundation, and with reference to all of the original materials that may have survived."

The introduction (pp. 3–17) gives a short historical summary which implicitly settles the question of the validity of the generic name, an analysis of characters, brief notes on the parasitism, the hosts and enemies of *Phoradendron*, the origin of the genus—it is regarded as probably of late Tertiary origin in the New World to which it is confined—and the range of species, the area of the genus as a whole extending from Washington, Southern Colorado, the mouth of the Ohio and Southern New Jersey to the La Plata in the South. The text, including the description of new species, is in English. The figures cover 237, or nine-tenths of the recognised forms, a very unusual degree of completeness of illustration. They are all reproductions of photographs of natural size, and where possible from type specimens. They will be of great help, but they also

---

* The Genus Phoradendron. A Monographic Revision. By W. Trelease. Urbana, III. Published by the University. 1916. pp. 1–224, pl. 1–245.

emphasize the limitations of this process of illustration. Many of the figures are no better than outline reproductions with all detail lost or blurred. The indices of collectors and of occurrence are very full and should be very useful.

The genus is divided into two primary divisions, namely, Boreales and Aequatoriales, which, apart from their geographical areas, are characterised by the absence or presence respectively of cataphyllary scales. Each of these divisions is divided again into sub-divisions and some of them again into minor groups. All the sub-divisions and minor groups as well as the species are conveniently keyed. Under each species we find a complete account of the synonomy, a description, general indication of distribution, and a complete list of the specimens examined.

O. S.

Lathyrus hirsutus.—In the Gardeners' Chronicle of 30th September, pp. 156–7 (1916), Prof. B. T. P. Barker gives an account of a series of experiments carried out at the Research Station, Long Ashton, Bristol, with the object of obtaining new forms of Sweet Peas by hybridising the orange-scarlet "Kitty Clive" with *Lathyrus hirsutus*, Linn. In order to avoid possible confusion between *L. hirsutus*, Linn., and *Orobus hirsutus*, Linn., which has been cited in the Index Kewensis, vol. iii. 375, as a synonym, but which is a very different species, it seems desirable to give the synonymy of each with a short differential diagnosis. The error no doubt arose through the amalgamation of the two genera proposed by Grenier and Godron and adopted in the Genera Plantarum.

Lathyrus hirsutus, *Linn.* Sp. Pl. 732 (1753); Boiss. Fl. Or. ii. 609; Beck in Reichb. Ic. xxii. 168, t. mmccliv. fig. v., vi., 12–15, Nyman Consp. 203. *L. hirtus*, Ten Fl. Nap. iv. in Syll. 302 (1830). *L. variegatus*, Host. Fl. Austr. ii. 327 (1831). *Lastila hirsuta*, Alef. in Bonplandia, ix. 147 (1861).—Leaf-stalks ending in a 3-forked curled tendril; leaflets linear or linear-lanceolate, scarcely 1 cm. broad; stipules linear, very acute, 1–2 mm. broad; seeds globose, with conspicuous wart-like wrinkles.

Distrib.—Europe, Asia Minor and North Africa.

Lathyrus laxiflorus, *O. Kuntze* in Act. Hort. Petrop. x. 185 (1887); Maly in Aschers. et Graebn. Synop. Mittel.-Europ. Fl. vi. ii. 1042. *Orobus hirsutus*, Linn. Sp. Pl. 728 (1753), non *Lathyrus hirsutus*, Linn., vide supra. *Orobus laxiflorus*, Desf. in Ann. Mus. Par. xii. 57, t. 8 (1808). *Lathyrus inermis* Rochel ex Friv. in Magyar Tud. Tár. Evkon. ii. 250, t. 2 (1835). *L. villosus*, Frivald. in Flora, xix. 437 (1836).—Leafstalks not ending in a tendril; leaflets elliptic or elliptic-lanceolate, with numerous parallel nerves; 1-2 cm. broad; stipules large and foliaceous, ovate, sagittate-auriculate at the base, about 2·5 cm. long and 1 cm. broad; seeds somewhat compressed, smooth.

Distrib.—Balkan States and Crete. J. H.

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OF

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No. 10.] **[1916.**

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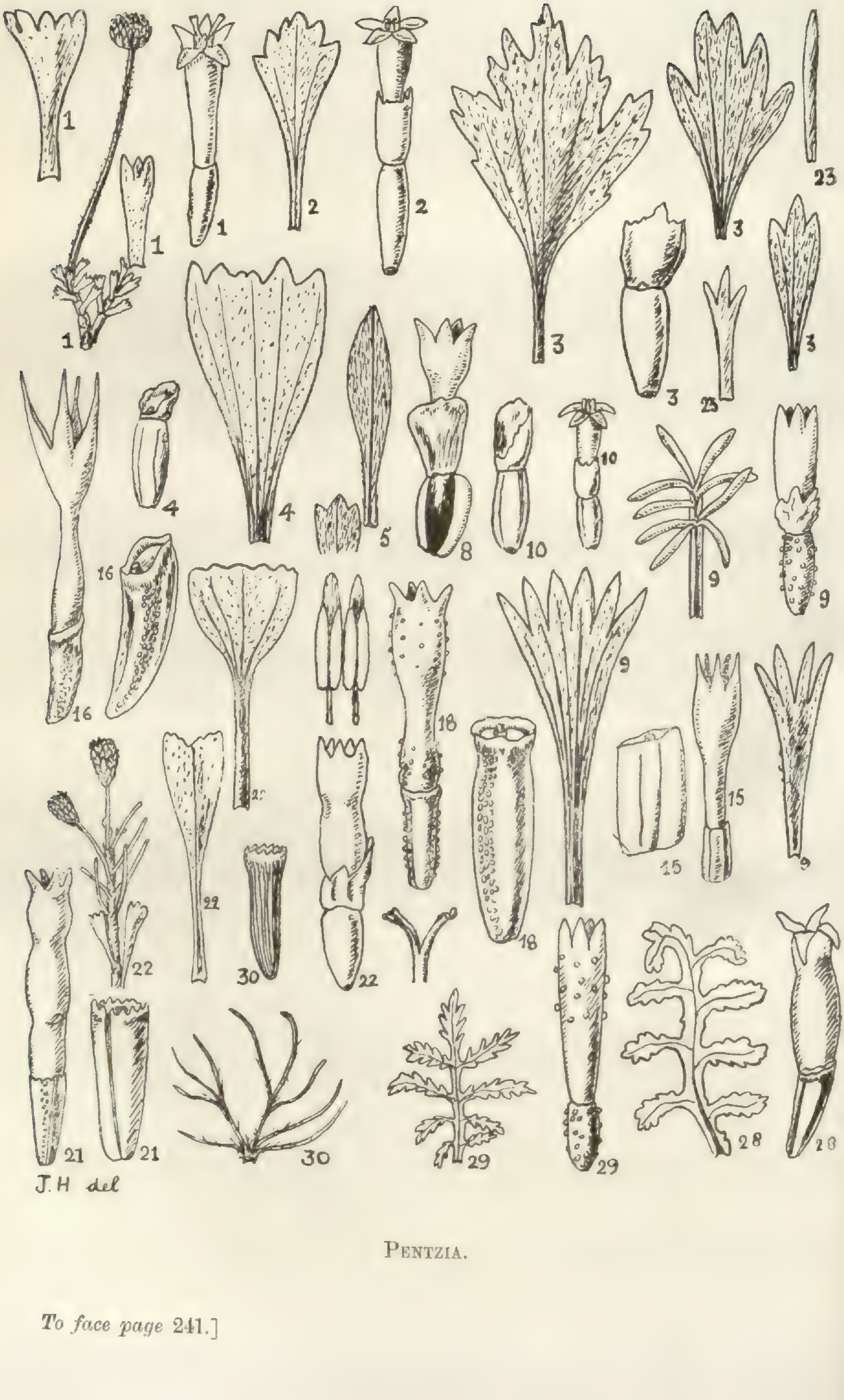

Pentzia.

To face page 241.]

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BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 10] [1916

XLV.—NOTES ON AFRICAN COMPOSITAE: III.

Pentzia, *Thunb.*

J. Hutchinson.

(With Plate.)

As limited in Harvey and Sonder's Flora Capensis, *Pentzia* and *Matricaria* are not separable by any definite character. We find in the generic key on page 128 of volume iii. that the species of *Pentzia* are characterised as "shrubs or half-shrubs," and *Matricaria* as "annuals, with pinnatisect leaves." But instead of uniting the two genera, as might reasonably be done, it seems better, in order to make as little change in the nomenclature as possible, to recast them by retaining in the South African *Matricaria* only those species with ray-flowers, and transferring the discoid species to *Pentzia*. The latter genus is restricted in distribution to South and South Tropical Africa, whilst *Matricaria* occurs in the Northern Hemisphere with a few representatives in South East Tropical and South Africa. The boreal species of *Matricaria* have predominantly radiate capitula, very few species being discoid. Relying partly on the geographical distribution, therefore, as Bentham has done in the case of *Aster* and *Olearia*, we may distinguish the two genera as follows:—

Pentzia, *Thunb.*—Capitula discoidea; frutices, suffrutices vel plantae annuae. Distrib.: Afr. austr. trop. et extratrop.

Matricaria, *Linn.*—Capitula radiata vel species paucae borealis discoideae. Distrib.: Hemisph. bor., Afr. austr. et trop. orient.

The species of *Pentzia* may be arranged conveniently into three sections: I. *Flabellifoliae,* with fan-like leaves toothed or lobed towards the apex and always associated with solitary capitula; II. *Monocephalae,* with much-divided leaves and long-peduncu-late solitary capitula; and III. *Corymbosae,* in which the leaves as a rule are much divided and the capitula aggregated into corymbs.

Pentzia is a good example of the large increase in the number of new species which have been discovered since the publication

(4659.) Wt. 71—728. 1,125. 12/16. J. T. & S., Ltd. G. 14.

of the third volume of the Flora Capensis in 1865, wherein there were (together with the discoid species of *Matricaria*) 16 species as compared with 30 in the present revision.

Pentzia, *Thunb.—Clavis specierum.*

I. Flabelliifoliae, sect. nov.—*Folia plus minusve cuneata vel flabelliformia, apice solum vel apicem versus dentata vel lobulata, dentibus vel lobulis ascendentibus, rarius integra; capitula solitaria, longe pedunculata.*

Folia haud integra :—
  Folia usque ad 5 mm. lata, vel latiora et etiam profunde lobulata :—
    Folia apice ambitu truncata :—
      Folia apice 3-5-fida, basi longe cuneata; pappus nullus... ... 1. *tortuosa.*
      Folia abrupte spathulata, apice undulato-dentata; pappus auriculaeformis ... ... 22. *dentata.*
    Folia apice ambitu rotundata :—
      Folia 5-fida... ... ... 2. *quinquefida.*
      Folia inciso-lobulata ... ... 9. *sphaerocephala.*

  Folia 8-15 mm. lata :—
    Folia apice ambitu rotundata, multilobulata ... ... 3. *argentea.*
    Folia apice truncata, dentata ... ... 4. *nana.*

Folia plerumque integra, apice rarius bi- vel tridentata, dense sericea ... ... 5. *monocephala.*

II. Monocephialae, sect. nov.—*Folia pinnatisecta vel decomposita; capitula solitaria, plerumque longe pedunculata.*

Pedunculi demum indurati et spinosi ... 6. *spinescens.*

Pedunculi haud indurati vel spinosi :—
*Pappus plerumque magnus et bene evolutus, auriculaeformis :—
  Suffrutices vel plantae annuae, parce ramosae, caulibus vel pedunculis elongatis :—
    Pappus apice integer; plantae annuae :—
      Folia simpliciter pinnatisecta, lobis planis ... ... 7. *dichotoma.*
      Folia bipinnatisecta, lobis satis crassis ... ... 8. *annua.*
    Pappus superne dentatus; caules basi lignosi ... ... 9. *sphaerocephala.*
  Suffrutices multe ramosi, ramulis numerosis pedunculis brevibus apicem versus foliatis :—
    Folia petiolata, parte superiori divisa; involucri bracteae obtusae ... ... 10. *incana.*

Folia plerumque e basi divisa; involucri bracteae exteriores angustae, plerumque acuminatae.

Ramuli leviter appresse pilosi vel glabri:—

Receptaculum conicum et post anthesin elongatum ... 11. *Galpinii.*

Receptaculum planum vel leviter concavum vel demum fere globosum.

Folia brevissima, internodiis vix aequilonga vel eos leviter excedentia, segmentis brevissimis; capitula 6-8 mm. diametro ... ... 12. *globosa.*

Folia internodia multo excedentia, segmentis longissimis filiformibus; capitula circiter 1 cm. diametro ... ... 13. *pinnatisecta.*

Ramuli dense albo-tomentosi; involucri bracteae interiores conspicue membranaceae ... ... 14. *lanata.*

**Pappus nullus vel brevissimus, integer vel denticulatus:—

Corollae lobi longiores quam lati, acutissimi, acuminati:—

Involucri bracteae numerosae, angustissimae, marginibus crispato-undulatis, glabrae; corolla 5-lobata; achaenia brevissima ... ... 15. *acutiloba.*

Involucri bracteae latiusculae et dense pubescentes; corolla 4-lobata; achaenia obliqua, basin versus angustata 16. *intermedia.*

Corollae lobi breves, obtusi, plus minusve triangulares:—

Involucri bracteae dense pubescentes:—

Folia dense sericea; pedunculi elongati, nudi; involucri bracteae fere subulatae ... ... 17. *albida.*

Folia breviter pubescentia; pedunculi vix elongati, basin versus parce foliati; involucri bracteae exteriores oblongae ... ... 18. *grandiflora.*

Involucri bracteae glabrae vel fere glabrae:—

Folia simpliciter pinnata:—

Foliorum segmenta satis lata; pedunculi brevissimi; capitula depressa; receptaculum globosum ... ... 19. *calva.*

Foliorum segmenta subteretia, angusta; receptaculum conicum ... ... 20. *hereroensis.*

Folia bi-vel tripinnata, segmentis angustis; pedunculi graciles, elongati; capitula globosa ... 21. *globifera.*

III. Corymbosae, sect nov.—*Folia decomposita, rarius linearia et integra vel flabelliformia; capitula in corymbos confertos aggregata.*

Folia flabelliformia, basi cuneata ... ... 22. *dentata.*

Folia integra et linearia vel apice trifida ... 23. *Cooperi.*

Folia incisa vel decomposita :—

Pappus auriculaeformis, bene evolutus :—

Folia glabra, glanduloso-punctata ... 24. *punctata.*

Folia sericea :—

Folia sicco sulphureo-sericea, lobulis brevibus obtusissimis; involucri bracteae glabrae ... ... 25. *elegans.*

Folia sicco cinerea, lobulis acutis; involucri bracteae pubescentes ... 10. *incana*, var. *microcephala.*

Pappus nullus vel annularis et brevissimus :—

Foliorum segmenta crassa carnosaque, satis lata :—

Folia brevissima, infra 1 cm. longa 26. *Bolusii.*

Folia matura ultra 1·5 cm. longa :—

Folia simpliciter vel subsimpliciter pinnatisecta ... ... 27. *Fenii.*

Folia bi- vel tripinnatisecta :—

Planta maritima, viscida; capitula circiter 1 cm. diametro 28. *sabulosa.*

Planta non viscida; capitula plerumque infra 0·5 cm. diametro ... ... 29. *tanacetifolia.*

Foliorum segmenta gracilia, filiformia... 30. *pinnatifida.*

1. **P. tortuosa,** *Fenzl* ex Harv. in Harv. et Sond. Fl. Cap. iii. 174 (1865).

Tanacetum tortuosum, DC. Prodr. vi. 133 (1837); Drège, Zwei Pflanzengeogr. Docum. 52, 53.

South Africa.—Karroo Region: Graaff Reinet; Sneeuwbergen, Dec., *Bolus* 584; Compassberg, Apr., *Shaw*.

Upper Region: Aliwal North; Witte Bergen, damp places, 2000-2300 m., Jan., *Drège*.

A very distinct species with crowded tortuous short branchlets, imbricate leaves and numerous capitula on slender nude peduncles.

Fig 1, branchlet with solitary flower-head, nat. size, leaves and flower enlarged.

2. **P. quinquefida,** *Less.* Synop. Comp. 266 (1832); Harv. in Harv. et Sond. Fl. Cap. iii. 173, partim.

Cotula quinquefida, Thunb. Fl. Cap. ed. Schult. 695 (1823). *Pentzia microphylla*, DC. Prodr. vi. 137 (1837).

South Africa.—Upper Region: Philipstown; near Riet Fontein, Waschbanks River, Mar., *Burchell* 2723. Colesberg; between Riet Fontein and Plettenberg's Beacon, Mar., *Burchell* 2745. 'South Africa,' *Thunberg* (type).

Kalahari Region: Orange River Colony; Bloemfontein, *Rehmann* 3783 (Herb. Mus. Brit.).

Fig. 2, leaf × 4, flower much enlarged.

3. **P. argentea,** *Hutchinson*, sp. nov. in Ann. S. Afr. Mus., cum icon., ined.

South Africa.—Western Region: Great Namaqualand; Great Karasberg, dry stream slopes (quartz) 65 m. above Wasserfall Alt Ravine (also at Krai Kluft), Jan., *Pearson* 7927; common in rock crevices between Dabaigabis and Gueindoorn, 1400 m., Feb., *Pearson* 3170; base of Kopje 20 km. N. of Kaman's Drift, *Pearson* 4529; Bushmanland; stony ground, Jan., *Pearson* 3832.

A very distinct species with fan-shaped silvery rather deeply lobulate leaves. The description will appear in my enumeration of the late Prof. Pearson's S.W. African *Compositae* in the Annals of the South African Museum.

Fig. 3, leaves showing the variation × 3, achene and ear-shaped pappus enlarged.

4. **P. nana,** *Burchell*, Trav. in S. Afr. 400 (1822).

P. quinquefida, var. *nana*, Harv. in Harv. et Sond. Fl. Cap. iii. 173 (1865).

Descr. ampl.—*Suffrutex*, basi lignosus; rami abbreviati, inferne petiolorum basibus persistentibus instructi, dense appresse tomentelli, superne dense foliati. *Folia* late cuneato-flabelliformia, apice ambitu truncata et grosse dentata, basi in petiolum 0·7-1 cm. longum attenuata, 1·5-2 cm. longa, 0·5-1·5 cm. lata, crasse coriacea, supra obscure infra conspicue 3-5-nervia, utrinque appresse tomentosa. *Capitula* subterminalia, solitaria, longissime pedunculata; pedunculi nudi, usque ad 15 cm. longi, sulcati, 1·25 mm. crassi, appresse pubescentes. *Involucri bracteae* dorso carinatae, oblongae, apice submembranaceae, obtusae, extra appresse pubescentes. *Corolla* 5-loba, glabra, lobis oblongo-lanceolatis subobtusis. *Achaenia* leviter costata, pappo auriculaeformi brevi coronata.

South Africa.—Kalahari Region: Griqualand West; right bank of the Vaal River at Blaauwbosch Drift, Oct., *Burchell* 1731 (type).

A very distinct species which has not been gathered since its discovery by Burchell.

Fig. 4, leaf × 2, achene and pappus enlarged.

5. **P. monocephala,** *S. Moore* in Bull. Herb. Boiss. Ser. II. iv. 1020 (1904).

Tropical Africa.—Damaraland: Windhoek, *Dinter* 343; Awas Mts., *Dinter* 1252; between Haris and the Awas Mts., on high plateaux, Jan., *Pearson* 9676.

South Africa.—Western Region: Great Namaqualand; Naukluft Mts.; between Goas and Kabiras, on river bank, Jan., *Pearson* 9074; stony plains south of Choaberib, plant strongly aromatic, Jan., *Pearson* 9460.

Fig. 5, leaves natural size.

6. **P. spinescens,** *Less.* Synop. Comp. 266 (1832); DC. Prodr. vi. 137; Harv. in Harv. et Sond. Fl. Cap. iii. 174.

Osteospermum spinescens, Thunb. Herb., partim, fide Harv. l.c.

South Africa.—Upper Region: Sutherland; at the Great Riet River, Aug., *Burchell* 1380. 'Cape,' *Thunberg* (type); *Masson* (Herb. Brit. Mus.).

7. **P. dichotoma,** *DC.* Prodr. vi. 138 (1837); Drège, Zwei Pflanzengeogr. Docum. 108. *Matricaria dichotoma,* Fenzl ex Harv. in Harv. et Sond. Fl. Cap. iii. 167 (1865).

South Africa.—Western Region: Little Namaqualand; near Port Nolloth, Aug., *Bolus* 6540; Vaarsche River, *Pearson* 6505. South Western Region: Vanrhynsdorp; Ebenezer; stony dry hillocks below 500 ft., Nov., *Drège* (type).

8. **P. annua,** *DC.* Prodr. vi. 138 (1837); Drège, Zwei Pflanzengeogr. Docum. 92. *Cotula Teesdaliae,* DC. l.c. 80 (1837): Drège, l.c. 96. *Matricaria albida,* Harv. in Harv. et Sond. Fl. Cap. iii. 166, partim.

South Africa.—Western Region: Little Namaqualand; between Holgat River and the Orange River, 330–500 m., Sept., Drège (type); near Concordia, 1100 m., Sept., *Bolus* 9572. South Western Region. Vanrhynsdorp; Zout River, July, *Schlechter* 8124; near Hol River, below 320 m., Aug., *Drège.*

In the Flora Capensis this species was erroneously reduced to *Matricaria albida,* Fenzl (*Pentzia albida,* Hutchinson—see note under that species).

Fig. 8, flower much enlarged.

9. **P. sphaerocephala,** *DC.* Prodr. vi. 138 (1837); Harv. in Harv. et Sond. Fl. Cap. iii. 173.

P. cinerascens, DC. l.c.; Drège, Zwei Pflanzengeogr. Docum. 65, 131. *P. quinquefida,* Harv. l.c., partim.

South Africa.—South Western Region: Uitenhage; Addo, grassy heights in sunny places, 320-640 m., Dec., *Drège b.*

Karroo Region: Willowmore; Kendos Mt., rocky places 1000—1300 m., June, *Drège a.* Graaff Reinet; mountains near Graaff Reinet, 1000 m., Apr., fls. yellow, *Bolus* 1069; *MacOwan* 449:

near Graaff Reinet, *Day* (Herb. Mus. Brit.). Somerset; near Little Fish and Great Fish Rivers, 630–930 m., Oct., *Drège a.*

Upper Region: Fraserburg; between Karree River and Klein Quaggas Fontein, near Fraserburg, *Burchell* 1429. Albert; *Cooper* 578.

Kalahari Region: Griqualand West; Asbestos Mts., at the Kloof Village, Feb., *Burchell* 2029.

Eastern Region: Stockenstrom; Katberg, *Shaw* 106. Queenstown; dry slopes near Queenstown, 1280 m., Jan., *Galpin* 1949; Engotini, Jan., *Baur;* Rhinoster River, *Burke;* Shiloh, Mar., 1160 m., *Baur* 790. 'South Africa,' *Harvey; Zeyher* 852 (Herb. Mus. Brit.).

On account of considerable variability in the shape of the leaves in this species, it has been entered in two places in the key. Its solitary flower-heads associated with usually much-divided leaves determine its position in the *Monocephalae*, but it forms a decided connecting link between this group and the *Flabellifoliae*, just as *P. dentata* does between the *Flabellifoliae* and the *Corymbosae*.

Fig. 9, cuneate leaves and flower enlarged, divided leaf about natural size.

10. **P. incana,** *O. Kuntze*, Rev. Gen. iii. ii. 166 (1898).

Chrysanthemum incanum, Thunb. Fl. Cap. ed. Schult. 693 (1823). *Pentzia virgata*, Less. Synop. Comp. 266 (1832); Harv. in Harv. et Sond. Fl. Cap. iii. 173; Oliv. in Hook. Ic. Pl. t. 2529. *Pentzia cotuloides*, DC. Prodr. vi. 138 (1837).

South Africa.—Western Region: Great Namaqualand; Great Karasberg, Naruda Süd, sandy plains, 1400 m., bush 0·5 m. high, fls. yellow, *Pearson* 7925. Little Namaqualand; between Uitkomst and Geelbekskraal, 620—920 m., Aug., *Drège a;* Nieuwfontein, *Pearson* 3348. Kamies Bergen, *Zeyher* 849. *Pearson* 6598; Plaat Klip, *Pearson* 3484.

South Western Region: Vanrhynsdorp; Windhoek, 100 m., *Schlechter* 8073, Robertson; Kochmann's Kloof, 260–400 m., *Mund* 118. Riversdale; between Zoetmelks River and Little Vet River, Nov., *Burchell* 6842. Kuysna; *Pappe.* Uitenhage; *Zeyher* 862.

Karroo Region: Worcester; mts. around Hex River, 960 m., Bolus 5212; Matjes Fontein, Witteberge, *Rehmann* 2934. Beaufort West; *Henderson* 14, 15, 17, 18, 21. Graaff Reinet; plains, *Bowie* (Herb. Mus. Brit.). 'Karroo,' *MacOwan* 585.

Upper Region: Carnarvon; Karee Bergen, 400 m., Aug., *Schlechter* 8194. Murraysburg; Dec., *Tyson* 360 (Herb. Mus. Brit.). Middleburg; plains at Schoombu, 1300 m., Feb., *MacOwan* 1896.

Kalahari Region: Bechuanaland; between Mafeking and Ramoutsa, *Lugard.* Griqualand West; right bank of Vaal River at Blaauwbosch Drift, Oct., *Burchell* 1742. Kimberley, *Rehmann* 3443. Orange River Colony; Bloemfontein, *Rehmann* 3792 (Herb. Mus. Brit.).

'Cape,' *Thunberg* (Herb. Mus. Brit.), *Masson.*

Known as the "Schaap Bosch."

Fig. 10, achene, pappus and flower much enlarged.

Var. **microcephala,** *Hutchinson. Pentzia virgata,* var. *microcephala,* Harv. l.c. 174.

Suffrutex diffusus, ramis plerumque procumbentibus, capitulis subcorymbosis parvis.

South Africa.—Karroo Region: Rhenoster Kop, April, *Burke* 528; *Zeyher* 854.

Schlechter 10498 from Bredasdorp Div., distributed under the name *Pentzia rupestris,* Schltr., probably belongs here; it is of more erect habit and with slightly larger heads than the variety.

11. **P. Galpinii,** *Hutchinson,* sp. nov.

Suffrutex e basi lignoso multe ramosus, ramulis erectis vel ascendentibus apicem versus foliatis gracilibus stramineis parce puberulis. *Folia* e basi divisa, pinnatisecta, 0·5–1 cm. longa, segmentis lineari-lanceolatis subteretibus sicco punctatis vel parce puberulis subcarnosis. *Capitula* solitaria, breviter pedunculata, circiter 7 mm. diametro. *Involucri bracteae* 2-3-seriatae, lineares, subacutae, 3–4 mm. longae, superne margine membranaceae, parce pubescentes. *Receptaculum* conicum, acutum, demum 4 mm. longum, minute foveolatum. *Flores* numerosi. *Corollae tubus* 1·75 mm. longus, inferne cylindricus, parce glandulosus, superne subcampanulatus, glaber; lobi 5, ovato-rotundati, 0·4 mm. longi, glabri. *Achaenia* crasse costata, in costis subserrulata, pappo auriculaeformi albo 0·5 mm. longo coronata.

Tropical Africa.—Damaraland: Welwitsch, Jan., *Galpin & Pearson* 7672.

12. **P. globosa,** *Less.* Synop. Comp. 266 (1832); DC. Prodr. vi. 137; Harv. in Harv. et Sond. Fl. Cap. iii. 174.

Pentzia globifera, Lichtenst. ex Less. l.c., nomen.

South Africa.—Karroo Region: Prince Albert; Gamka River, May, *Burke.* Graaff Reinet; *Bolus* (plant covered with insect galls).

Upper Region: Fraserburg; Zak River, Aug., *Burchell* 1492. Murraysburg; open places around Murraysburg, 1300 m., Mar., *Tyson* 333. Colesberg; *Shaw; Arnot.*

Kalahari Region: Basutoland, *Hort. Sprenger* 16. Griqualand West; Blaauwbosch Drift, Oct., *Burchell* 1747.

Eastern Region: Albany; near Grahamstown, *MacOwan.* Queenstown; Klaas Smits River, Jan., *Baur* 984; Bradford Drift, 1100 m., Nov., *Galpin* 2631.

'South Africa,' *Zeyher* 850, 851, 853.

Known as the "Karroo Bosch."

13. **P. pinnatisecta,** *Hutchinson,* sp. nov. in Ann. S. Afr. Mus. ined.

South Africa.—Western Region: Great Namaqualand; dry stream beds between Dabaigabis and Gründoorn, bush 1 m., fls. yellow, Feb., *Pearson* 3114; sandy river bed 25 km. north

of Warmbad, bush 0·65 m., fls. greenish yellow, Feb., *Pearson* 4307; Akam River bed, Feb., *Pearson* 4733.

This species is very similar to *P. globosa*, Less., but it has much longer leaves with very long lateral segments and larger capitula; from *P. lanata*, Hutchinson, the description of which will also appear in my account of the *Compositae* of the Percy Sladen Expeditions in the Annals of the South African Museum, it may be distinguished by the much narrower herbaceous inner bracts and less hairy branchlets.

14. **P. lanata,** *Hutchinson*, sp. nov. in Ann. S. Afr. Mus. ined.

South Africa.—Western Region: Great Namaqualand; sandy plains at Schakalskuppe, 1500 m., fls. yellow, Feb., *Pearson* 4781; Great Karasberg Range; sandy bank of dry water course on high plateaux 5 miles S.E. of Wasserfall, Jan., *Pearson* 7926; dry stream bed, sandy plain west of Ganus, Feb., *Pearson* 4488. Inachab, *Dinter* 1201 (Herb. Mus. Brit.).

South-Western Region: Vanrhynsdorp; Knechts Vlagte, 200 m., July, *Schlechter* 8153.

'South Africa,' *Barrett-Hamilton* (Herb. Mus. Brit.).

Except for the conspicuously membranous inner involucral bracts and larger capitula, this new species might be considered a very hairy form of *P. globosa*, Less.

15. **P. acutiloba**, *Hutchinson*, comb. nov.

Tanacetum acutilobum, DC. Prodr. vi. 132 (1837); Drège, Zwei Pflanzengeogr. Docum. 92. *Cenocline acutiloba*, Koch in Bot. Zeit. i. 43 (1843). *Matricaria acutiloba*, Harv. in Harv. et Sond. Fl. Cap. iii. 166 (1865). *Chamaemelum acutilobum*, Fenzl ex Harv., l.c.

South Africa.—Western Region: Little Namaqualand; Orange River banks near Verleptpram, below 160 m., Sept., *Drège*.

Fig. 15, achene and flower much enlarged.

16. **P. intermedia**, *Hutchinson*, sp. nov.

Matricaria grandiflora, var. β, Harv. in Harv. et Sond. Fl. Cap. iii. 166 (1865).

Herb annua usque ad 15 cm. alta, caule simplici vel e basi ramoso pubescenti. *Folia* petiolata, simpliciter vel bipinnata, 1·5-3 cm. longa, 1–2 cm. lata, densiuscule pilosa, lobulis ultimis oblongo-lanceolatis obtusis vel subacutis 0·5-1 mm. longis subcarnosis. *Capitula* longe pedunculata, solitaria, 1-1·5 cm. diametro; pedunculi nudi, 3-7 cm. longi, superne leviter sensim incrassati, sulcati, breviter pubescentes. *Receptaculum* convexum, crebre foveolatum. *Involucri bracteae*, 2-3-seriatae, lanceolatae vel oblongo-lineares, subacutae, extra dense pubescentes. *Corollae* tubus medio leviter constrictus, 3·5 mm. longus, glaber; lobi 4, lineari-lanceolati, acute acuminati, 1 mm. longi. *Achaenia* obliqua, basin versus angustatus, minute glandulosa. *Pappus* subnullus.

South Africa.—South-Western Region: Clanwilliam; Hoek, 620 m., Aug., *Schlechter* 8705. "Cape," without collector's name in *Herb. Hooker*.

Fig. 16, flower and achene much enlarged.

17. **P. albida**, *Hutchinson*, comb. nov.

Tanacetum albidum, DC. Prodr. vi. 132 (1837). *Matricaria albida*, Fenzl ex Harv. in Harv. et Sond. Fl. Cap. iii. 166, partim (1865). *Matricaria hirsutifolia*, S. Moore in Bull. Herb. Boiss. Ser. II. iv. 1019 (1904).

South Africa.—Western Region: Great Namaqualand; Angra Pequena, Oct., *Schenck* 22; Inachab, *Dinter* 1221. 'South Africa,' *Zeyher* 837.

Harvey in the Flora Capensis l.c. reduced *Pentzia annua*, DC., to *Matricaria albida*, Fenzl. the latter founded on *Tanacetum albidum*, DC. Amongst the specimens referred to *M. albida* at Kew, I found two species, one with a large pappus as described in the Flora Capensis, and another without a pappus, but otherwise apparently indistinguishable. As De Candolle did not mention a pappus in his description of *Tanacetum albidum*, I suspected that the plant without one was identical with that species. Mr. Casimir De Candolle very kindly examined the type specimen, collected by Drège, and preserved in the De Candolle herbarium at Geneva, and has confirmed my surmise.

18. **P. grandiflora**, *Hutchinson*, comb. nov.

Tanacetum grandiflorum, Thunb. Fl. Cap. ed. Schult. 642 (1823); DC. Prodr. vi. 132; Drège, Zwei Pflanzengeogr. Docum. 107. *Cotula tripinnata*, Thunb. l.c. 696. *Cenocline grandiflora*, Koch in Bot. Zeit. i. 41 (1843). *Matricaria grandiflora*, Fenzl ex Harv. in Harv. and Sond. Fl. Cap. iii. 166, excl. var. β (1865).

South Africa.—Western Region: Little Namaqualand; Mt. Spektakel, Nov., *Morris in Herb. Bolus* 5732.

South-Western Region: Vanrhynsdorp; Ebenezer, sand hills below 160 m., Nov., *Drège a*; between Driefontein and Heerenlogement, *Pearson* 6808. Clanwilliam; between Clanwilliam and Lange Kloof, *Pillans* 5345.

Fig. 18, flower and achene, much enlarged.

19. **P. calva**, *S. Moore* in Bull. Herb. Boiss. Ser. II. iv. 1020 (1904).

Tropical Africa.—Damaraland: Awas Mts., *Dinter* 290 (Herb. Mus. Brit.).

20. **P. hereroensis**, *O. Hoffm.* in Bull. Herb. Boiss. vi. 751 (1898).

Tropical Africa.—Hereroland: Haikamchab, Jan., *Galpin & Pearson* 7660; mouth of the Tsoachaub River, July, *Dinter*, 32.

Except for having a very rudimentary pappus and not a large ear-shaped one, this species can scarcely be distinguished from *P. Galpinii*, Hutchinson. I have not seen the type specimen.

21. **P. globifera**, *Hutchinson*, comb. nov.

Cotula globifera, Thunb. Fl. Cap. ed. Schult. 696 (1823). *Tanacetum obtusum*, Thunb. l.c. 641. *Tanacetum globiferum*, DC. in Deless. Ic. iv. t. 48; DC. Prodr. vi. 132; Drège, Zwei Pflanzengeogr. Docum. 62, 128. *Cenocline globifera*, Koch, Bot. Zeit. i. 41 (1843). *Matricaria globifera*, Fenzl ex Harv. in Harv. and Sond. Fl. Cap. iii. 165 (1865).

South Africa.—Western Region: Little Namaqualand; Port Nolloth, Jan., *Galpin & Pearson* 7650; south of Plaat Klip, *Pearson*, 3505, 3862.

South-Western Region: Swellendam, *Pappe*. Robertson; Kochman's Kloof, Nov., *Mund* 117. Mossel Bay; dry channel of an arm of the Gouritz River, Nov., *Burchell* 6464; between Zout River and Duyker River, Nov., *Burchell* 6370. Uitenhage, *Zeyher*. Port Elizabeth; sand hills and rocky places below 30 m., Dec., *Drège b;* Algoa Bay, *Forbes*.

Karroo Region: Ceres; Ongeluks River, July, *Burchell* 1222. Beaufort West; Nieuwveld Mts., near Beaufort West, 1000-1650 m., Oct., *Drège a*; Beaufort District, *Cooper* 477.

Upper Region: Calvinia; Loeriesfontein, *Pearson* 4842.

Eastern Region: Albany; Slaay Kraal, *Burke;* Fish River heights, *Hutton;* Pluto's Vale, *MacOwan* 256. Queenstown; Shiloh, Dec., *Baur* 963.

'South Africa,' *Mund*, *Thunberg*, *Bowie*, *Thom* 235, 246.

Fig. 21, flower and achene, much enlarged.

22. **P. dentata,** *O. Kuntze*, Rev. Gen. Pl. iii. ii. 166 (1898).

Gnaphalium dentatum, Linn. Sp. Pl. 854 (1753). *Tanacetum flabelliforme*, L'Herit. Sert. Angl. 21, t. 27 (1788). *Pentzia flabelliformis*, Willd. Sp. Pl. iii. 1808 (1800); Drège, Zwei Pflanzengeogr. Docum. 56; Harv. in Harv. et Sond. Fl. Cap. iii. 172. *Pentzia crenata*, Thunb. Fl. Cap. ed. Schult. 637 (1823). *Balsamita flabelliforme*, Pers. Synop. Pl. ii. 408 (1807). *Pentzia flabelliformis*, vars. *Burchellii* et *Burmanni*, DC. Prodr. vi. 137 (1837).

South Africa.—South-Western Region: Worcester; Hex River Valley, at Groote Tafelberg, *Rehmann* 2740. Oudtshoorn; dry hills between Oudtshoorn and Moerass River, 520 m., Dec., *Bolus* 12017. Uniondale; Long Kloof, between Avontuur and the source of Keurbooms River, Mar., *Burchell* 5048; rocky hill near Haarlem, Mar., *Burchell* 4902, 4989.

Karroo Region: Graaff Reinet; near Graaff Reinet, 830 m., Dec., *Bolus* 183.

Upper Region: Richmond; Uitvlugt, near Stylkloof, *Drège a & b;* Great Tafelberg, near Richmond. *Burchell* 2119-3.

Eastern Region: Albany; near Grahamstown, Dec., *MacOwan* 846.

'South Africa,' *Thom* 195, 387, 441; *Forster; Wallich* 856; *Burke* 120; *Zeyher* 855; cultivated at Kew in 1777 (Herb. Mus. Brit.).

Fig. 22, young shoot with some heads removed, nat. size, leaves and flower enlarged.

23. **P. Cooperi**, *Harv.* in Harv. and Sond. Fl. Cap. iii. 173 (1865).

South Africa.—Karroo Region: Somerset East; amongst stones at the top of the Boschberg, 1540 m., July, *MacOwan* 145, Graaff Reinet; Bamboesberg, 1000 m., Nov., *MacOwan* 585; mountain sides near Graaff Reinet, Oudeberg, 1500 m., Apr., *Bolus* 585; Sneeuwbergen, 1430 m., Feb., *Bolus* 585 bis.

Upper Region: Middelburg; near Middelburg, *Shaw*. Albert; *Cooper* 628 (cotype). 'Basutoland,' Cooper 711 (cotype); banks of streamlet above Buffalo River Waterfall, about 2700 m., Mar., *Galpin* 6705. Barkly East; Doodman's Kranz Mt., Drakensberg, about 2830 m., Mar., *Galpin* 6706; pass below Mont aux Sources, 3000-3320 m., Mar., *Evans* 745.

The leaves of this plant are either entire or trifid at the apex, as shown in fig. 23, nat. size.

24. **P. punctata**, *Harv.* in Harv. and Sond. Fl. Cap. iii. 172, in syn. (1865).

P. Burchellii, Harv, l.c. quoad descr., non Fenzl.

South Africa.—Upper Region: Fraserburg; between Great Riet River and Stink Fontein, Aug., *Burchell* 1389. Murraysburg; valleys near Coetzier's Kraal, 1450 m., Mar., *Tyson* 399; valleys near Murraysburg, *Tyson* 390. Colesburg; Zuurberg, Dec., *Burke* 503; near Colesburg, 1650 m., *Shaw*. Philipstown; on the Table Mt. near Paarde Bërg, Mar., *Burchell* 2699. 'South Africa,' *Zeyher* 848 (Herb. Mus. Brit.).

Pentzia Burchellii, Harv. (*Tanacetum Burchellii,* DC.) founded on *Burchell* No. 1337, from the Sutherland Div., is a species of *Cotula*, and will eventually probably bear the same specific name under that genus, which is much in need of revision.

25. **P. elegans,** *DC.* Prodr. vi. 136 (1837); Drège, Zwei Pflanzengeogr. Docum. 65; Harv. in Harv. et Sond. Fl. Cap. iii. 172.

South Africa.—Karroo Region: Laingsburg; Witteberge, Maggisfontein, *Rehmann* 2935. Prince Albert; Zwartberg Pass, about 1500 m., Dec., *Bolus* 11550; foot of Zwartberg Range, Dec., *Bolus* 12016. Willowmore; Kandos Mt., in stony, dry, and rocky places, 1000-1320 m., June, *Drège*.

26. **P. Bolusii**, *Hutchinson*, sp. nov.

Suffrutex decumbens ramosissimus, ramis procumbentibus elongatis angulatis stramineis appresse albo pubescentibus, ramulis elongatis foliatis albo–sericeo–tomentosis. *Folia* petiolata, pinnatisecta, 0·4–1 cm. longa, segmentis carnosis subteretibus apice obtusis mucronulatis primum albo-tomentosis demum subglabris. *Capitula* corymbosa, 5–10–nata, breviter pedunculata, subglobosa, circiter 4 mm. diametro. *Involucri bracteae* 4–seriatae, ab extremo sensim longiores, exteriores triangulari–lanceolatae, subobtusae, interiores oblongae, apice

rotundatae, marginibus late membranaceis, fere glabrae. *Receptaculum* conico-convexum, parvum, minute verrucosum. *Corollae tubus*, 1·25 mm. longus, subcylindricus, parce glandulosus; lobi 5, oblongo-lanceolati, subacuti. *Achaenia* brevissima, angularia, basi callosa, glabra. *Pappus* nullus.

South Africa.—Upper Region: Murraysburg; open places around Murraysburg, Dec., *Bolus* 360.

27. **P. Eenii**, *S. Moore* in Journ. Bot. xxxvii. 401, t. 401 B (1899).

Tropical Africa.—Damaraland, *Een* 1879; Okanse, *Dinter* 616 (Herb. Mus. Brit.).

28. **P. sabulosa**, *Hutchinson*, comb. nov.

Matricaria sabulosa, Wolley Dod in Journ. Bot. 1901, 399; Bolus et Wolley Dod in Trans. S. Afr. Phil. Soc. xiv. 282 (1903).

South Africa.—South-Western Region: Cape; sandy places of Klein Kalk Bay beyond Sea Point, Oct., *Wolley Dod*, 3421.
Fig. 28, leaf, nat. size, flower much enlarged.

29. **P. tanacetifolia**, *Hutchinson*, comb. nov.

Cotula tanacetifolia, Linn. Syst. Veg. ed. xii. 564 (1767). *Tanacetum multiflorum*, Thunb. Fl. Cap. ed. Schult. 642 (1823); DC. Prodr. vi. 132. *T. leptolobum*, DC. l.c. 133 (1837). *T. fruticosum*, Harv. in Harv. et Sond. Fl. Cap. iii. 166, nomen in syn., errore Linn. attrib. *Matricaria multiflora*, Fenzl ex Harv. l.c. 166 (1865), incl. var. *leptoloba*, Harv.; Bolus et Wolley Dod in Trans. S. Afr. Phil. Soc. xiv. 282 (1903).

South Africa.—Western Region: Little Namaqualand; near Ookiep, Oct., *Bolus* 5733; Brakwater, *Pearson* 6072.
South-Western Region: Clanwilliam; sandy cornlands, *Pillans* 5340. Tulbagh; Vogel Vallei, below 320 m., Oct., *Drège a.* Cape; Sea Point, Sept., *Wolley Dod* 1882; Nov., *MacOwan* 1894; Green Point, *Hooker* 142; Camps Bay, Dec., *Burchell* 309.
Upper Region: Calvinia; various localities, *Pearson* 3079, 3971, 3969, 4086. 'South Africa,' *Villette*.
Locally abundant on the Cape Peninsula at Sea Point, Paarden Island, Simon's Town, and Miller's Point; rare in Chapman's Bay—*Bolus & Wolley Dod, l.c.*
Fig. 29, leaf, nat. size, flower much enlarged.

30. **P. pinnatifida,** *Oliv.* in Hook. Ic. Pl. t. 1340 (1881).

South Africa.—Eastern Region: Natal; Inanda, Aug., *Wood* 168 (type); stony places, Botha's Hill, 800 m., Oct., *Wood in Herb. MacOwan* 1880; fields at Botha's Hill, 1450 m., Nov., *Tyson* 3111. 'Natal,' *Gerrard*.
Fig. 30, leaf, nat. size, achene enlarged.

var. **chenoleoides**, *Hutchinson*, var. nov., a typo foliis brevioribus segmentis subteretibus, ramulis junioribus axillaribus abbreviatis dense pilosis differt.

South Africa.—Eastern Region: Pondoland; Faku's Territory, *Sutherland*. East Griqualand; top of Mt. Currie, 2400 m., May, *Tyson* 1254. Natal; stony hill near Murchison, May, *Wood* 3110; near Curry's Post, Apr., *Wood* 1007 (Herb. Mus. Brit.).

Both the species and variety show a very decided affinity and close generic connection with *Athanasia*, especially with *Athanasia acerosa*, Harv., but the receptacular paleae characteristic of that genus are lacking. The variety is very similar to certain species of the genus *Chenolea* (*Chenopodiaceae*).

Species non visa.

Matricaria Schlechteri, *Bolus* ex *Schlechter* in Engl. Bot. Jahrb. xxvii. 208 (1899).

South Africa.—South-Western Region: Clanwilliam; Lambert's Bay, near the sea-shore, Aug., *Schlechter* 8540.

I have not seen an example of this species, which is described as having discoid capitula, and must therefore be included in *Pentzia* according to the definition of the genus in the present paper. From the description it appears to belong to the group *Flabellifoliae*.

Explanation of the Plate.—The numbers of the figures correspond to the number preceding the species in the text, where the enlargement is given.

XLVI.—CONIFEROUS TIMBERS: III.

The Asiatic Pines.

W. Dallimore.

The genus *Pinus* is well represented in Central and Northern Asia, although several of the species are less well known than the European and N. American members of the same family; in fact some of them have but recently been introduced to the British Isles, and little is known of their economic importance or their ability to withstand the climatic conditions prevailing in this country. Several species found in N.W. Asia, and others found in Asia Minor, are common in Europe, and as they were dealt with in an article in *K.B.* No. 6, 1915, they are omitted from the present notes.

The best-known Asiatic species are:—

P. Armandi, Franchet; *P. Bungeana*, Zuccarini; *P. densiflora*, Sieb. & Zucc.; *P. excelsa*, Wallich; *P. Gerardiana*, Wallich; *P. Khasya*, Royle; *P. koraiensis*, Sieb. & Zucc.; *P. longifolia*, Roxburgh; *P. Massoniana*, Sieb. & Zucc.; *P. Merkusii*, Jungh & de Vriese; *P. parviflora*, Lambert; *P. Thunbergii*, Parlatore.

They differ a good deal in size and habit, as well as in commercial importance, though inaccessibility and difficulty of extraction in several cases has doubtless more to do with the

absence of the timber of certain species from the market, than the quality of the wood. A number of the Asiatic pines are grown for ornamental purposes in the British Isles, but it is doubtful whether any serious attempt has been made to establish them here under silvicultural conditions.

P. Armandi, *Franchet.*—Fruit Pine, Cow Pine.

In general appearance there is a great resemblance between this Chinese pine and *P. excelsa*, but in the leaves of this there is a more decided twist than in the leaves of the Himalayan tree and the cones are broader in comparison with their length. In N. and N.W. China it is said to grow 50–60 ft. high, and the wood is used for building purposes and the coarser kinds of furniture. The seeds are edible, and are used as food in some parts of China. It was introduced to the British Isles barely 20 years ago, and the largest trees in the country, about 20 ft. high, are growing at Kew. The species does not appear to possess commercial possibilities.

P. Bungeana, *Zuccarini.*—Lace Bark Pine.

This is a very distinct and ornamental pine from N. China, where it forms a fine tree 80-100 ft. high and up to 12 ft. in girth, conspicuous by reason of the white or grey colour of the bark of old trees, and by the brown bark of young trees being shed in small plates disclosing green young bark beneath, thus giving trunks and branches a peculiar mottled character. The leaves are bright green, resinous, and produced in threes. Two forms appear to be in cultivation in the British Isles, one which is inclined to produce several leaders from low down on the stem, and the other of pyramidal outline with a single leader. Mr. E. H. Wilson reports regarding the timber of this tree that the wood is brittle and only used for fuel. Trees in this country are still too young to show the white bark, which is considered to be the most pleasing character of the species, but the young bark is shed in the same way as that of trees in their native country.

P. densiflora, *Sieb. & Zucc.*—Japanese Red Pine, Female Pine.

In many respects this tree bears a resemblance to the Scots pine, and it occupies the same position of importance with regard to Japanese pines as the Scots pine does to European species. It is known in Japan under the name of aka-matsu, and is said to be the commonest conifer in the empire, growing in a variety of soils, except where the land is very wet, between 500-3000 ft. elevation. It varies a good deal in size, and may be found from 50-120 ft. high with a girth of 3 12 ft. The sap-wood is yellow and the heart-wood reddish. It is described as hard and elastic, rich in resin, and durable against moisture. According to "Forestry in Japan," the timber is highly appreciated for public engineering and mine timber, and is also in abundant demand for building purposes. An interesting fact connected with this tree is that one of the most popular

edible mushrooms of Japan is grown beneath its shade. Although the tree grows well here there is no reason to suppose that it will be of any value for forest planting.

P. excelsa, *Wallich.*—Bhotan Pine, Blue Pine.

This is one of the best known trees of the Himalaya, and the most satisfactory pine from that region for cultivation in the British Isles. It belongs to the Weymouth pine group, in which the leaves are produced in bundles of five, but is easily distinguished from the Weymouth pine by its longer leaves and larger cones. Gamble, "A Manual of Indian Timbers," says that it is common at altitudes between 6000–12500 ft., sometimes as a pure stand and at other times mixed with *Cedrus Deodara*, *Pinus longifolia*, and other trees. Under the most satisfactory conditions it grows 120–150 ft. high with a girth of 8–12 ft. The timber is considered to be second only to that of the Deodar in usefulness amongst Himalayan Conifers, and is in demand for constructive work, railway sleepers, tea boxes, and other minor uses. It is usually suggested, however, that the wood ought to be treated with a preservative before being used for sleepers. The wood weighs on an average 30–32 lbs. a cubic foot, and in colour the sapwood is yellowish and the heart-wood light red. It is very resinous, and a considerable quantity of resin is extracted from the standing trees, tapping being carried on for three successive years, after which the trees are given at least three years' rest.

P. excelsa grows luxuriantly in many part of the British Isles, and forms a handsome tree when given plenty of room. Examples 60–90 ft. high are fairly common, though there are many trees that develop in width at the expense of height. The branches are more or less horizontal, and as the lower ones grow rapidly in length and diameter, a tree of no great height may cover a wide area of ground. The abnormal development of a few branches may affect the strength of the trunk, and it is not uncommon to find trees with very thin and weak tops, although the branch system of the lower parts of the trees may be strong and vigorous. It is also liable to form several leaders, therefore a strict watch should be kept upon young trees and rival leaders, and very vigorous branches checked in the early stages. Exposure to violent winds appears to injure the upper parts of the trees, those growing in sheltered positions forming finer specimens than others that are moderately exposed. As a woodland tree it would probably prove satisfactory. The timber from trees grown for ornamental purposes is coarse and knotty, the knots being both large and numerous.

P. Gerardiana, *Wallich.*—Himalayan Edible Pine, Gerard's Pine.

Although this tree was introduced to the British Isles in 1839, very few examples are known to exist, the largest one in England, a specimen under 20 ft. high, is growing in the Cambridge Botanic Garden. In Ireland one has been recorded as being

upwards of 25 ft. high. It is a native of the Western Himalaya, Afghanistan, etc., and at its best grows 60–80 ft. high with a girth of 8–12 ft. The bark is very curious as it is shed regularly in small patches, giving the trunk a peculiar mottled appearance very similar to that of the better known *P. Bungeana*. The wood is very resinous, and of moderately good quality; it is not, however, used very extensively as the trees are preserved as far as possible for the sake of the seeds, which form an important article of food to the natives, and are also roasted and eaten by Europeans. Gamble, l.c., p. 709, says that the tree inhabits dry and arid regions in isolated areas of no great extent, at altitudes generally between 6000–10000 ft. The weight of the wood is given as 44–47 lbs. a cubic foot.

P. Khasya, *Wallich.*—Khasia Pine.

This is found in the Khasia Hills, Burma, and other places. It grows 60–100 ft. high with a girth up to 8–10 ft. The wood as shown by specimens in Museum III, at Kew, is resinous and brownish in colour. It looks to be of fairly good quality, but Gamble, l.c., p. 709, suggests that as a building timber it is not very durable. Its resinous character has led to its use for torches, and it is popular for fuel. There does not appear to be any possibility of its becoming of any importance to the timber merchant. It produces resin of good quality.

P. koraiensis, *Sieb. & Zucc.*—Korean Pine, Siberian Yellow Pine, Kedr.

A good deal of attention has been paid to this tree during the last few years, for it is one of the most important coniferous timber trees of Asia. It is widely distributed in Eastern Siberia, Korea, Manchuria, Japan, etc., where, at its best, it is 120–150 ft. high with a trunk 8–9 ft. in girth. The leaves are in bundles of five, and their arrangement, together with the downy young bark, is suggestive of *P. Cembra*, the cones, however, are double the size of those of that species, and they have very distinct scales. During the last few years attention has been directed to the timber for general use, and in addition to a good deal being shipped to Australia several cargoes were received in this country before the outbreak of war under the name of Siberian yellow pine. The wood left little to be desired in the matter of quality, for it was of good size and apparently equal to European pine and American white pine in quality, but heavy freight charges were against it, and a Liverpool merchant in discussing the timber gave the freight as £7 10s., a standard from E. Siberian ports as against £2 2s. 6d., a standard from Canada to Liverpool. The tree is hardy in the British Isles, but is not likely to be of value for forest planting. For further information regarding this pine see *K.B.*, 1914, p. 199.

P. longifolia, *Roxburgh.*—Long-leaved Pine, Chir.

Although the timber of this tree is considered to be inferior in quality to that of the blue pine, it is a useful species as a

timber producer, whilst it is the most important resin-producing conifer of N. India. A native of the Himalaya it occurs between 1500–7500 ft. elevation in the west, but is said to ascend little over 3000 ft. in the east. At its best it forms a very large tree with a straight trunk, but in some districts the trunk is said to twist badly, making it of little value for constructive work. The better classes of timber are used for building purposes, whilst the wood is reported as making good charcoal. It has also been suggested that it would answer very well for railway sleepers if creosoted. Large quantities of resin are collected annually from this species, and Gamble reports, l.c. p. 707, that in a good season a tree will generally give about 12 lbs. of resin. It occurs over a considerable area of country, often as a pure stand, and belongs to the three-leaved group of the genus, being easily recognised by its leaves often exceeding 9 in. in length, and by its large woody cones. A good series of specimens of resin, turpentine, and other products may be seen in Museum III. at Kew. In "Indian Forest Utilization," by R. S. Troup, 1907, p. 169, reference is made to this and other resin-producing pines of India as follows:—"In India systematic tapping of *Pinus longifolia* has been carried on for several years in the Himalayas: this species does not produce the best quality of resin, the turpentine being inferior to that of several other pines for making varnish owing to the difficulty with which it dries, but as the tree is plentiful and accessible the tapping of it is highly remunerative, while the existing demand for the turpentine for medical purposes testifies to its purity. The Indian pines which produce the best quality of resin are *Pinus Khasya*, found in Assam and Burma, and *P. Merkusii*, occurring to a limited extent in Burma; these two pines are for the most part situated in remote places, so that the cost of transport has hitherto largely prohibited their remunerative tapping. *Pinus excelsa* produces resin less freely than *P. longifolia*, but the turpentine and colophony obtained from it are of rather better quality." The species is too tender for the British Isles, and the timber is not likely to find a market outside India and adjacent countries.

P. Massoniana, *Sieb. & Zucc.*

This is a native of S. China, and of no value outside its native country. It is too tender for general cultivation in the British Isles, and trees found under that name are usually wrongly named. Under normal conditions it forms a large tree, and the timber is used locally.

P. Merkusii, *Jungh & de Vriese.*

This pine is found in the Malay Archipelago, where, under suitable conditions, it attains a height of 60–100 ft., with a girth of 6 ft. or so. The wood is heavy, of good quality, and rich in resin, but the tree is not sufficiently common to be of much commercial value, whilst difficulties of extraction render it unlikely that the timber will ever be of general use. It produces resin of good quality.

P. parviflora, *Lambert.*—Japanese White Pine.

Although not an imposing tree as seen in the British Isles, this, the "himeko-matsu" of Japan, is said to be the most conspicuous feature in certain parts of that country, where, according to "Forestry in Japan," it spreads over the mountain ranges of Iwashiro, starting from an elevation of 1600 metres, along the borders of Kozuke and Echigo, and in Tsushima and Shiribeshi, Hokkaido. A form of the tree is also found in the Kurile Islands. It belongs to the group bearing leaves in bundles of five, and is usually met with 50–60 ft. high, although it sometimes attains a height of 100 ft. The wood is considered to be less useful than that of other Japanese pines, and is only used locally. As heavy coning commences very early in life growth is often checked, and trees in this country usually present a stunted appearance and are not very ornamental.

P. Thunbergii, *Parlatore.*—Japanese Black Pine.

Next to *P. densiflora* this is the most important pine in Japan, where it grows 100–120 ft. high with a girth of 12–20 ft. The leaves are in pairs 3–4 in. long, and the cones, which are 2–2½ in. long are often produced in large clusters, 40–65 cones having been counted in individual clusters. Moreover, male and female flowers may sometimes be found in the same cluster. In Japan it is known by the name of "kuro-matsu," and is planted as a wind-break in addition to being useful for reclaiming sand dunes and other purposes. The wood is used for many purposes, but is said to be inferior to that of *P. densiflora*. The tree grows well in the British Isles, and has been used in the Channel Islands and in Ireland as a wind-break near the sea.

XLVII.—CONTRIBUTIONS TO THE FLORA OF SIAM.

Additamentum IX.

Flacourtia lenis, *Craib* [Bixaceae-Flacourtieae]; ab affini *F. molli*, Hook. f. et Th., petiolis longioribus distinguenda.

Frutex circiter 3·6 m. altus, ramis majoribus spinis armatis (ex *Kerr*); ramuli juventute densius molliter pubescentes, demum glabri, cortice cinereo-brunneo rarius cinereo obtecti. *Folia* oblonga, oblongo-elliptica vel oblongo-ovata, apice rotundata vel breviter subacuminata, basi rotundata vel cuneata, usque ad 12 cm. longa et 6 cm. lata, chartacea, supra demum costa nervisque lateralibus parce breviter pubescentia, subtus mox costa nervisque molliter pubescentia et ibi demum puberula tantum, nervis lateralibus utrinque 3–5 subtus prominulis, nervis transversis pagina utraque conspicuis vel demum superiore subprominulis, margine crenato-serrata, petiolo ad 1·5 cm. longo molliter pubescente suffulta; stipulae parvae, mox deciduae. *Flores* ♀ axillares et terminales vel e ramulis anni prioris orti, saepissime racemosim dispositi, pedicellis ad 8 mm. longis molliter pubescentibus suffulti. *Sepala* ovata, obtusiuscula, 2·25 mm. longa, 1·75 mm. lata, ciliata, utrinque pubescentia. *Discus* 0·25 mm.

altus, glaber. *Ovarium* 1·5 mm. altum, apice in collum brevem et latum angustatum, glabrum; styli 6, recti, persistentes, circa 0·75 mm. longi.

Chiengmai, Doi Sutep, mixed jungle, 330 m., *Kerr* 1700.

Polygala Lacei, *Craib* [Polygalaceae]; a *P. cardiocarpa*, Kurz, capsulis longioribus, ala pro rata angustiore, seminibus duplo majoribus tuberculis paucioribus majoribus ornatis differt.

Herba 12–20 cm. alta, caule angulato glabro stramineo vel rubro-brunnescente, ramulis lateralibus satis validis. *Folia* iis *P. umbonatae* similia. *Racemi* 8–13 cm. longi, pedunculo communi ut rhachi angulato circa 1 cm. longo suffulti; bracteae deciduae, pedicellis subaequales; pedicelli 1 mm. longi. *Sepala* aliformia elliptica vel ovato-elliptica, stipite brevi incluso 3·5 mm. longa 2·5 mm. lata, alia circa 1·25 mm. longa. *Corolla* lutea (ex *Kerr*), 3·5 mm. longa. *Capsula* subrotundata vel quadrato-rotundata, apice subtruncata vel retuso-truncata, 3·5 mm. longa et ala inclusa usque ad 4·25 mm. lata, ala superne (ubi latissima) 0·75 mm. lata inferne latitudine gradatim decrescente ornata; semina nigra, tuberculis pro rata magnis ornata, carunculis exclusis 1·25 mm. longa, glabra, ut in genere albo-carunculata et etiam ad chalazam umbone nigro nitido haud tuberculato vix vel paulo prominente ornata.

Doi Chieng Dao, on rocks, 1650–1770 m., *Kerr* 2889.

Distr. Upper Burma, Ruby Mines, *Lace*.

Polygala umbonata, *Craib* [Polygalaceae]; a *P. furcata*, Royle et *P. hyalina*, Wall., seminibus ad chalazam arillo conspicuo atro nitido seminibus subdimidio breviore ornatis, et a *P. cardiocarpa*, Kurz, seminibus pubescentibus distinguenda.

Herba annua, 15–20 cm. alta; caulis viridis, canaliculatus, glaber, apice furcatus, ramulis paucis lateralibus brevibus tenuioribus evolutis. *Folia* lanceolata, oblongo-lanceolata vel ovato-lanceolata, apice acuta, mucronata, basi in petiolum angustata vel plus minusve distincte acuminata, usque ad 6 cm. longa et 2·5 cm. lata, membranacea, supra viridia, sparsissime nisi ad marginem ubi densiuscule setulosa, subtus pallidiora, glabra, nervis lateralibus utrinque 4–6 supra conspicuis subobscurisve intra marginem arcuatim conjunctis et nervum continuum intramarginalem saltem superne formantibus, petiolo ad 1 cm. longo suffulta. *Racemi* glabri, usque ad 3·5 cm. longi, pedunculo communi 1·5–2·5 cm. longo suffulti; bracteae angustae, pedicellos paulo superantes, sub anthesin deciduae; pedicelli graciles, 1–1·5 mm. longi. *Sepala* duo aliformia elliptica, stipite brevi incluso 3·5 mm. longa, 2·5 mm. lata, alia 1·5 mm. longa. *Corolla* sulphurea (ex *Vanpruk*), 4 mm. longa. *Capsula* magis minusve rotundata, ala inclusa 3–3·5 mm. diametro, ala apice latissima vix 0·5 mm. lata, inferne latitudine decrescente et ima basi vix evoluta; semina (carunculis exclusis) nigra, pubescentia, minute copiose tuberculata, 1·25 mm. longa, ut in genere albo-carunculata praetereaque ad chalazam carunculo atro nitido pubescente haud tuberculato 0·75 mm. longo ornata.

Prê, Hue Tuam, 270 m., *Vanpruk* 328.

Distr. Upper Burma, *Lace* 5477; S. Shan States, Loi Mwe, 1650 m., *MacGregor* 21.

Paramignya rectispinosa, *Craib* [Rutaceae-Aurantieae]; ab affini *P. Griffithii*, Hook. f., spinis rectis vel subrectis fere 2 cm. longis distinguenda.

Frutex sarmentosus; ramuli virides, tenuiter pubescentes, mox puberuli, ad 3·5 mm. diametro; spinae axillares, rectae vel subrectae, ad fere 2 cm. longae, virides nisi apice stramineae, pubescentes. *Folia* oblonga vel oblongo-oblanceolata, apice obtuse acuminata, basem versus gradatim angustata, rotundata, 10·5–14 cm. longa, 2·8 4·7 cm. lata, rigide chartacea, pagina superiore nisi costa praecipue inferne tomentella rarissime subglabra glabra, inferiore molliter pubescentia, copiose pellucido-punctata, nervis lateralibus utrinque circiter 15 intra marginem vix conspicue anastomosantibus supra subconspicuis subtus prominulis; petioli 1–1·1 cm. longi, supra canaliculati, indumento ut ramuli tecti. *Flores* albi (ex *Kerr*), solitarii, pedicellis circiter 3 mm. longis parcius breviter pubescentibus paulo supra basem bracteolis parvis instructis suffulti. *Calyx* 2 mm. longus, extra pubescens, intra glaber, lobis 5 deltoideis vel anguste deltoideis obtusiusculis tubo paulo brevioribus. *Petala* oblonga, 1·2 cm. longa, 3 mm. lata, glabra, conspicue glanduloso-punctata. *Filamenta* 8 mm. longa, pubescentia, ut petala glandulosa, antheris 2 mm. longis. *Discus* calyce paulo brevior. *Ovarium* circa 1 mm. altum, densius pubescens, stylo 7 mm. longo pilis divergentibus instructo, stigmate capitato.—*Atalantia Griffithii*, Craib, Contrib. Fl. Siam in Aberd. Univ. Studies No. 57, p. 33 *vix* Paramignya Griffithii, *Hook. f.*

Chiengmai, Doi Sutep, evergreen jungle, 660 m., *Kerr* 1718.

Paramignya Surasiana, *Craib* [Rutaceae-Aurantieae]; a *P. monophylla*, Wight, filamentis haud glabris facile distinguenda.

Frutex scandens; ramuli 3 mm. diametro, puberuli, cortice viridi parum striatulo obtecti; spinae recurvae, 7–9 mm. longae, apice stramineae, inferne virides vel stramineo-virides. *Folia* saepius obovata vel elliptico-obovata, apice obtuse caudato-acuminata, basi late cuneata vel rotundata, 10–14 cm. (acumine ad 1 cm. longo incluso) longa, 5·2 7·5 cm. lata, chartacea, costa subtus parce breviter pubescente excepta glabra, glandulis satis crebris pagina inferiore conspicuis, subtus pallidiora, nervis lateralibus utrinque saltem 10 saepissime rectis intra marginem prominulis, petiolo 1·5–1·7 cm. longo puberulo suffulta. *Pedicelli* circa 4 mm. longi, inferne parvi-bracteolati. *Alabastra* oblonga, apice rotundata, ad 1·4 cm. longa. *Calyx* 5·5 mm. longus, extra ut pedicelli crispatim pubescens, intra adpresse pubescens, lobis quoad longitudinem inter se parum inaequalibus 1–2·5 mm. longis apice rotundatis ciliolatis. *Petala* alba (ex *Kerr*), omnia manca, saltem 1·7 cm. longa, glabra. *Filamenta* 1·2 cm. longa, angulata, apice albo-pubescentia, medio bifacialiter albo-pubescentia, ima basi fere glabra. *Ovarium* breve, dense pubescens, stylo circiter 9 mm. longo pubescente.

Chiengmai, Doi Sutep, evergreen jungle, 1650 m., *Kerr* 2542.
The fruiting specimen collected at Pegu by McClelland and included in Fl. Brit. Ind. under *P. Griffithii* is rather referable to this species.

Osbeckia Garrettii, *Craib* [Melastomaceae-Osbeckieae]; ab affini *O. crinita*, Benth., foliis tenuioribus supra sparse setosis, ramulorum setis patulis haud adpressis facile distinguenda.
Ramuli obtuse quadranguli, cinereo-brunnei, setis satis longis basi tumidis divergentibus subdense instructi, 2-2·5 mm. diametro. *Folia* oblongo-lanceolata lanceolatave, apice acute acuminata, basi obtuse cuneata, 5–10 cm. longa, 1–2·8 cm. lata, chartacea, pagina superiore sicca viridia, setis adpressis sparse instructa, inferiore parum pallidiora, ad nervos sparse longius setosa, e basi 5-nervia, nervis inter se ad imam basem liberis supra immersis subtus prominentibus, nervis transversis satis numerosis inter se plus minusve parallelis supra parum immersis subtus gracilibus prominulis, margine integra vel subintegra, petiolo 3–4 mm. longo adpresse setoso supra canaliculato suffulta. *Paniculae* terminales, subcongestae, parce ramosae, breves, floribus sessilibus; bracteae plus minusve ovatae, apice acutiusculae acuminataeve, 4–6 mm. longae, extra medio sparse setosae, intra glabrae, margine longius setoso-ciliatae. *Receptaculum* 9 mm. altum, extra setis basi tumidis solitariis vel per 2 3 aggregatis saepissime sessilibus sparse tectum praetereaque pilis perbrevibus nitidis quasi glandulas elongatas simulantibus parce instructum. *Calycis* tubus 0·75 mm. longus, segmenta 5·5 mm. longa, 0·5 mm. lata, apicem versus gradatim angustata, summo apice acuta, glabra nisi margine distanter longe setoso-ciliata, cum setis solitariis vel appendiculis brevibus apice setosis haud glanduliferis alternantia. *Petala* 4, oblongo-elliptica vel subelliptica, vix unguiculata, 1·6 cm. longa, 9 mm. lata, ciliolata. *Stamina* 8, circa 2 cm. longa, antheris filamentis subaequilongis. *Ovarium* ambitu oblongo-ovatum, apice conico hirsuto incluso 4·5 mm. longum; stylus circa 1·8 cm. longus.
Doi Intanon, 1050 m., *Garrett* 51.

Osbeckia paludosa, *Craib* [Melastomaceae-Osbeckieae]; ab *O. cinerea*, Cogn., calycis lobis angustioribus, ab *O. stellata*, Don et *O. crinita*, Benth., ramulorum indumento denso haud adpresso inter alia differt.
Frutex circiter 1·8 m. altus (ex *Kerr*); ramuli dense cinereo- vel pallide ferrugineo- vel ferrugineo- hirtuli, pilis primo patulis mox deflexis persistentibus, obtuse quadrangulares. *Folia* oblongo-lanceolata, oblongo-ovata vel rarius oblonga, apice acuta vel brevissime acute acuminata, basi rotundata vel interdum subtruncata, 2·4–6 cm. longa, 1·2–3 cm. lata, chartacea vel chartaceo-coriacea, pagina superiore primo subsericea, mox adpresse pilosa, inferiore sicco lutescentia, molliter pubescentia pilis plus minusve adpressis nisi ad nervos longioribus rigidioribus et divergentibus, 5–7-nervia, nervis ad imam basem liberis pagina superiore impressis inferiore prominentibus, nervis transversis sat numerosis inter se parallelis supra parum impressis subtus

prominulis, margine inconspicue serrulata vel integra, ciliata, petiolo 1–4 mm. longo eodem indumento ae ramulis obtecto suffulta. *Flores* purpurei (ex *Kerr*), in paniculas terminales e spicis plerumque simplicibus ad 8 cm. longis compositas dispositi; bracteae deciduae, ovatae vel late ovatae, 3·5 4·5 mm. longae, dorso strigosae, intra glabrae, strigoso-ciliatae. *Receptaculum* 9 mm. altum, appendiculis filiformibus setosis subdense hirsutum. *Sepala* 4, lineari-lanceolata, apice attenuato-acuminata, 6–7 mm. longa, 1·75–2 mm. lata, extra paucisetosa, intra glabra, longe ciliata, cum appendiculis filiformibus setosis alternantia. *Petala* 4, obovata, apice rotundata, ad 2·2 cm. longa, 1·6 cm. lata, apice pauciciliata. *Antherae* 1 cm. longae, connectivo basi parum producto paucisetoso, filamentis 9 mm. longis suffultae. *Ovarium* 6·5 mm. altum, apice anguste conicum, setosum, stylo 2–2·1 cm. longo.

Doi Sutep, open marshy ground, 330 m., *Kerr* 2740.

Argostemma plumbeum, *Craib* [Rubiaceae-Hedyotideae]; ab *A. tavoyano*, Wall., foliis apice rotundatis, floribus majoribus, ab *A. courtallensi*, Arn., corollae lobis latioribus, staminibus brevioribus distinguendum.

Herba nana. *Folia* bene evoluta duo, opposita (1–2 multo minoribus interdum additis), aequalia vel inaequalia, prostrata, elliptica vel oblongo-elliptica, apice basique rotundata vel interdum basi latissime cuneata, 2·5-5·5 cm. longa, 1·5-4·5 cm. lata, membranacea, sicco supra fusco-viridia, subtus plumbea, pagina superiore setulis brevibus hic illic instructa vel subglabra, inferiore ad costam nervosque furfuracea et ad nervulos parcissime brevissime pilosula, nervis lateralibus utrinque 6–8 saltem superioribus intra marginem arcuatim conjunctis supra obscuris vel fere obscuris subtus prominulis, nervis transversis subtus conspicuis gracilibus, margine breviter ciliolata, petiolo perbrevi furfuraceo suffulta. *Pedunculus* communis 3–4·8 cm. longus, furfuraceo-puberulus, cymam umbelliformem 2–5-floram gerens; bracteae 1–2 mm. longae, deciduae vel persistentes, furfuraceae; pedicelli 5–9 mm. longi. *Receptaculum* breve, setulosum. *Calycis* tubus brevis; lobi 4, oblongi vel anguste deltoidei, 2 mm. longi, 1·25 mm. lati, dorso setulosi, ciliati. *Corolla* alba (ex *Kerr*); tubus 4 mm. longus; lobi breviter acuminati, 2·5 mm. longi, 3·75 mm. lati. *Antherae* 2·25 mm. longae, poris duobus apicalibus dehiscentes, filamentis 1·5 mm. longis suffultae.

Gorge below Ban Kaw, c. 195 m., on damp rocks in jungle, *Kerr* 2197.

Mussaenda dehiscens, *Craib* [Rubiaceae-Mussaendeae]; a speciebus aliis asiaticis fructu apice loculicide dehiscente recedit.

Arbor 7–8-metralis; ramuli primo adpresse strigosi, plus minusve glabrescentes, mox cortice pallide brunneo vel cinereo-brunneo lenticellato obtecti, praesertim ad nodos compressi, apicem versus plerumque conspicue bifacialiter canaliculati. *Folia* oblanceolata, oblongo-oblanceolata vel ovato-lanceolata, apice acuminata, acuta, basi cuneata, 10–17 cm. longa, 2·5–6 cm. lata, tenuiter chartacea, pagina superiore pilis paucis subrigidis

hic illic instructa sed ad costam nervosque laterales plus minusve adpresse strigillosa, inferiore ad nervulos parce strigosa et ad costam nervosque adpresse strigosa, plus minusve glabrescentia, nervis lateralibus utrinsecus 10 superioribus intra marginem anastomosantibus supra conspicuis subtus prominentibus, nervis transversis subtus prominulis, petiolo ad 1 cm. longo adpresse strigoso supra canaliculato suffulta; stipulae bifidae, 4 mm. longae, aliae persistentes, aliae deciduae. *Inflorescentia* e corymbo terminali multifloro ad 15 cm. diametro constituta, pedunculis inferioribus sub fructu usque ad 9 cm. longis, floribus in ramulis ultimis secundis fere sessilibus, sepalis expansis in inflorescentia quaque 4–6; bracteae persistentes vel deciduae, circa 3 mm. longae, angustae; alabastra acuminata. *Receptaculum* 2 mm. altum, vix 2 mm. diametro, puberulum. *Sepala* normalia deltoidea, acuta, 1 mm. longa, 0·75 mm. lata, ciliata, dorso parce puberula, mox decidua; aucta ovata-lanceolata, late ovata vel saepissime ovata, apice acuta vel obtusa, basi cuneata vel acuminata, usque ad 9 cm. longa et 6·5 cm. lata, e basi 5-nervia, petiolo ad 3 cm. longo supra late canaliculato subtus sulcato suffulta. *Corollae* tubus 1·8 cm. longus, extra adpresse fulvo-hirsutulus, intra summo apice dense sulphureo-villosus, inferne pilis paucis sulphureis instructus; limbus 12 mm. diametro, lobis late obovatis dorso infra apicem cornutis. *Antherae* inclusae, vix 3 mm. longae. *Stylus* inclusus, glaber. *Fructus* obovoideus vel ellipsoideo-obovatus, circa 8 mm. longus, apice loculicide dehiscens; semina minuta, angulata, foveolata, exalata.

Wieng Papao, mixed jungle, 510 m., *Kerr* 2522.

Distr. Yunnan, *Henry* 12825. Tonkin, *Balansa* 2683, 2684, *Wilson* 13642 (ex Herb. Henry).

Leptodermis venosa, *Craib* [Rubiaceae-Paederieae]; foliis parvis nervis conspicuis, sepalis longius acute attenuatis cognoscenda.

Ramuli graciles, juventute pilis rigidiusculis prorsus curvatis instructi, mox bifacialiter tantum pubescentes, cortice cinereo tenui cito soluto. *Folia* late lanceolata, oblanceolata lateve oblanceolata, apice breviter acute acuminata, basi in petiolum brevem vel vix distinctum attenuata, 8–20 mm. longa, 4-9 mm. lata, subcoriacea, pagina superiore glabra vel costae basem versus pilis paucis brevibus satis rigidis instructa, inferiore pallidiora, glabra vel ad costam nervosque laterales setulis paucis brevibus instructa, nervis lateralibus utrinsecus 3–5 cum costa supra prominentibus subtus tenuioribus prominulis; stipulae e basi satis lata aristato-acuminatae, 2–2·5 mm. latae. *Flores* ad apices ramulorum brevium gesti, sessiles; bracteolae in tubum late turbinatum 1·25 mm. altum receptaculum laxe cingentem margine ciliatum vel subfimbriatum connatae, longius aristato-acuminatae, aristis tubo paulo brevioribus. *Receptaculum* bracteolarum tubo paulo altius, glabrum. *Sepala* lanceolata, acuminata, 1·5 mm. longa, basi 0·75 mm. lata, rigide setuloso-ciliata. *Alabastra* oblonga, apice pilis paucis rectis satis robustis instructa. *Corollae* tubus 7 mm. longus, extra glaber, intus paulo supra

medium annulo denso lato pilorum ornatus, supra annulum sparsius pilosus; lobi 2·75 mm. longi. *Filamenta* 0·75 mm. longa, antheris paulo exsertis 1·5 mm. longis. *Stylus* inclusus, gracilis, apice bifidis.

Chiengmai, 300 m., cultivated, *Kerr* 3680.

Vaccinium Garrettii, *Craib* [Vacciniaceae-Vaccineae]; *V. Forrestii,* Diels, peraffine, sed corolla intus haud glabra et praesertim eius lobis intus saepe densius pilosis distinguendum.

Arbuscula inflorescentia excepta glabra, ramulis primo pallide brunneis mox cinereis vel cinereo-brunneis. *Folia* obovato-oblanceolata, ovato-lanceolata vel rarius late lanceolata, apice longius acuminata vel attenuato-acuminata, calloso-acuta, basi cuneata vel subrotundata, 4–10 cm. longa, 2–4 cm. lata, coriacea, sicco subtus cupreo-brunnea, nervis lateralibus utrinsecus saepius 6–8 rectis intra marginem anastomosantibus supra parum elevatis vel tantum subconspicuis subtus prominentibus, nervulis inter se satis distantibus subtus prominulis, margine serrulata, petiolo circiter 8 mm. longo supra valde canaliculato suffulta. *Racemi* axillares, ad 7·5 cm. longi, pedunculo communi petiolo subaequilongo vel eo paulo longiore incluso, rhachi cum pedunculo angulata glabra ima basi bracteis pluribus sterilibus persistentibus instructa; bracteae late lanceolatae, subulato-acuminatae, circa 8 mm. longae et 3·5 mm. latae, margine glanduloso-fimbriatae; pedicelli glabri, sub anthesi 2 mm. longi, apice cum receptaculo articulati, medio bracteolis duabus subalternis fere 4 mm. longis 2 mm. latis subulato-acuminatis margine irregulariter glanduloso-fimbriato-serratis ornati. *Receptaculum* glabrum, circa 2 mm. altum et 2·5 mm. diametro. *Calycis* tubus fere 0·5 mm. longus; lobi late deltoidei vel ovato-deltoidei, acuti vel brevissime acuminati, circa 1·5 mm. longi et 1·75 mm. lati, apicem versus breviter ciliolati. *Corollae* albidae (ex *Garrett*) tubus 7 mm. longus, extra glaber, intus tenuiter pubescens; lobi vix 1·5 mm. longi. *Stamina* 6·25 mm. longa, filamentis 2·75 mm. longis complanatis piloso-barbatis; antherae dorso aristis duabus 0·75 mm. longis sursum directis ornatae, minute papillosae. *Stylus* validus, 8 mm. longus, glaber.

Doi Intanon, Pah Ngeam, North Peak, 2165–2170 m., *Garrett* 79.

Nyctanthes aculeata, *Craib* [Oleaceae-Jasmineae]; a speciebus aliis habitu sarmentosa ramulisque aculeatis recedit.

Frutex sarmentosus; ramuli hirsutuli, quadrangulares, ad angulos incrassati et aculeis primo rectis mox recurvis instructi, cortice brunneo vel pallide brunneo obtecti, circa 3–3·5 mm. diametro. *Folia* plerumque oblonga, ovata vel late ovata, apice triangularia vel acuminata, mucronulata, basi cuneata, rotundata vel fere truncata, usque ad 5·5 cm. longa et 5 cm. lata, chartacea, pagina superiore setis rigidis erectis scabrida, inferiore pilis albis satis rigidis adpressis sparsis scabridiuscula, e basi 3–5-nervia, nervis secondariis (e costa ortis) utrinque 1–3 intra marginem furcatis omnibus supra conspicuis interdum parum impressis subtus prominentibus, nervis transversis subtus vix conspicuis vel

subprominulis, margine revoluta, distanter pauci-lobulata vel sinuato-lobulata, lobulis rotundatis interdum mucronatis, petiolo hirsutulo supra canaliculato circa 1 cm. longo suffulta. *Flores* in capitula axillaria solitaria et in cymas trichotomas terminales disposita aggregati; pedunculi 1–3·3 cm. longi, hirsutuli, paulo supra basem bibracteati; bracteae involucrales oblongo-oblanceolatae, circiter 4 mm. longae, satis crassae et rigidae, extra breviùs pubescentes, intra glabrae, ciliatae. *Calyx* usque ad basem 5-7-partitus, segmentis lineari-oblanceolatis acutis fere 3·5 mm. longis circa 0·5 mm. latis extra in margine dense longius pilosis intra glabris. *Alabastra* apice pilis erectis brevibus albis instructa. *Corollae* tubus (in alabastro) 1·75 mm. longus; lobi iis *N. Arbortristis* quoad formam similes. *Antherae* 1·25 mm. longae, corollae tubi apicem versus filamentis brevibus insertae. *Ovarium* glabrum, 0·75 mm. altum; stylus stigmate bifido incluso vix 2 mm. longo. *Fructus* oblatus, apice emarginatus, acuminatus, 1·3 cm. longus, 2 cm. (alis inclusis) latus; semina solitaria erecta.

Mê Ping Rapids, Ban Kaw, mixed jungle, 220 m., *Kerr* 3066.

Gentiana (**Stenogyne**) **australis,** *Craib* [Gentianaceae-Swertieae]; *G. leptocladae*, Balf. f. et G. Forrest, persimilis sed antheris longioribus et seminibus alatis distinguenda.

Herba annua, patens, caulibus viridibus rubescentibusve glabris angulatis mox alis angustis scabridis instructis. *Folia* ovata vel late ovata, basi subtruncata, superiora caulem saepe amplectentia, apice subacuta obtusave, ad 1·3 cm. longa et 1·1 cm. lata, satis rigida, e basi 5–7-nervia, nervis supra conspicuis subtus prominulis, pagina superiore glabra, inferiore ad nervos scabrida, margine recurvo argute denticulata, sessilia vel breviter petiolata. *Flores* purpurei (ex *Kerr*), et axillares et terminales, ramulis lateralibus gracilibus quorum folia quam ea caulium multo minora gesti, inter folia suprema breviter pedicellati. *Calycis* membranacei tubus anguste obconicus, 6 mm. longus, angulis quinque superne subalatis scaberulis; lobi aristati, 5 mm. longi. *Corolla* 2·8 cm. longa, lobis breviter caudato-acuminatis circa 8·5 mm. longis et 3·5 mm. latis, plicis apice fimbriatis quam lobis 3 mm. brevioribus. *Antherae* 3 mm. longae. *Ovarium* 1·1 cm. longum, stipite circa 2·5 mm. longo suffultum, stylo 9 mm. longo. *Capsula* corollam vix aequans; semina brunnea, trigona, anguste sed distincte alata.

Doi Chieng Dao, 1650–1770 m., common on rocky ground, *Kerr* 2865.

Rivea Collinsae, *Craib* [Convolvulaceae-Convolvuleae]; ab affini *R. ornata*, Choisy, foliis supra haud glabris distinguenda.

Frutex volubilis; ramuli juventute densius albo-hirsutuli, mox parce hirsutuli, cortice brunneo demum longitudinaliter fisso obtecti, lenticellis sparsis vix conspicuis. *Folia* ovata, late ovata vel oblata, apice acuminata, costa excurrente longe apiculata, basi latius cordata, 6–9 cm. longa, 7–10·5 cm. lata, chartacea, pagina superiore pilis brevibus rigidiusculis adpressis marginem versus brevioribus densioribus, inferiore pilis longiori-

bus adpressis nisi ad costam nervosque sparsioribus instructa, nervis lateralibus utrinque 8–10 rectis intra marginem furcatis ramulis prope marginem arcuatim conjunctis supra conspicuis vel subprominulis subtus cum costa prominentibus, margine ciliata, petiolo 3–7 cm. longo sulcato suffulta. *Inflorescentia* axillaris, pluriflora, 5–6 cm. longa, pedunculo, rhachi, pedicellis bracteisque sparsius adpresse hirsutis; bracteae deciduae, lanceolatae oblanceolataeve, acutae vel attenuato-acuminatae, circa 1·5 cm. longae et 3 mm. latae. *Sepala* 5, oblonga vel ovata, apice rotundata, 1·3–1·4 cm. longa, 0·9–1·2 cm. lata. *Corolla* purpurea et alba, 5·5 cm. longa, glabra. *Filamenta* 1·8 cm. longa, basi albo-hirsuta, antheris 5 mm. longis. *Stylus* gracilis, 3·8 cm. longus, stigmate bifido, lobis ambitu oblongo-rotundatis; ovarium disco cupulari brevius. *Fructus* plus minusve globosus, sepalis persistentibus extra brunneis intra stramineis circa 1·7 cm. longis; semina 4, pallide brunneo-pilosa.

Srirãcha, 0-4·5 m., *Kerr* 2149, *Mrs. D. J. Collins* 53.

Boea Kerrii, *Craib* [Gesneraceae-Cyrtandreae]; a *B. Scinhoei*, Hance, cui peraffinis, foliis majoribus longius petiolatis, cymis laxioribus, pedicellis longioribus, inter alia recedit.

Caules erecti, simplices, rarissime ramosi, 54–70 cm. alti, inferne lignosi, fistulosi, primo cinnamomeo-pannoso-arachnoidei. *Folia* opposita, quoad formam parum variabilia, plerumque oblonga vel elliptico-oblonga vel ovata, apice saepissime subacuminata, acutiuscula, basi in petiolum attenuata, cuneata vel acuminata, 6–17 cm. longa, 3–7·5 cm. lata, membranacea vel chartaceo-membranacea, pagina superiore mox fere glabra, inferiore persistenter cinnamomeo-arachnoidea, nervis lateralibus utrinque 10–14 marginem versus prorsus curvatis et ibi superioribus arcuatim conjunctis supra conspicuis vel subconspicuis subtus cum costa prominentibus, nervulis sparsis subtus prominulis, margine minute crenato-denticulata vel subintegra; petioli distincte alati, 1·5–7·5 cm. longi, illi paris utriusque inter se aequilongi vel inaequilongi, basi commisura conjuncti. *Cymae* laxae, et axillares et terminales, per plantae partem dimidiam superiorem fere distributae; pedunculi communes 2–3·5 cm. longi, partiales 0·7–1·3 cm. longi; pedicelli 6–9 mm. longi, cum pedunculis bracteisque indumento ei caulium simili obtecti; bracteae angustae, 2–3 mm. longae vel interdum inferiores usque ad 1 cm. longae. *Sepala* oblonga, apice rotundata, duo antica quam alia parum majora, 2 mm. longa, 0·75 mm. lata, omnia glabra. *Corollae* albae (ex *Kerr*) tubus late campanulatus, 3·75 mm. longus, apice circa 6 mm. diametro, glaber; labium posticum 2-lobatum, lobis rotundatis circa 3 mm. diametro, anticum e lobis tribus quorum laterales mediano paulo majores circa 2 mm. longi et lati constitutum. *Filamenta* 3·5 mm. longa, superne incrassata, complanata, incurva; antherae 2·75 mm. longae, supra medium firme cohaerentes. *Pistillum* 7 mm. altum, glabrum, disco vix evoluto. *Fructus* vix maturus, gracilis, stylo persistente incluso 3 cm. longus.

Doi Sutep, on humus on rocks by stream in evergreen jungle, 600 m., *Kerr* 1973.

Ornithoboea Wildeana, *Craib* [Gesneraceae--Cyrtandreae]; ab *O. Lacei*, Craib, cui proxime accedit, corollae labii inferioris lobis apice haud emarginatis recedit.

Caulis viridis, glanduloso-albido-pilosus. *Folia* opposita vel subopposita, inaequilateralia, latere altero dimidiatim ovata, altero dimidiatim ovato-lanceolata, apice acuminata, basi inaequialta, saepe anguste cordata, ad 10 cm. longa et 6·7 cm. lata, membranacea, supra viridia, pilosula, subtus pallidora, praesertim ad costam nervosque pilosa, nervis lateralibus utrinsecus ad 10 infimis patulis medianis arcuatis supremis satis obliquis, crenata, petiolo usque ad 5·7 cm. longo glanduloso-piloso suffulta. *Inflorescentia* generis, axillaris, pedunculo communi circiter 2 cm. longo ut caule glanduloso-piloso apice bracteis duabus linearibus glanduloso-pilosis circa 1·1 cm. longis et 1·75 mm. latis instructo suffulta; pedicelli 1 1·1 cm. longi, glanduloso-pilosi. *Sepala* post anthesin reflexa, usque ad 13 mm. longa et 3·5 mm. lata, extus glanduloso-pilosa, intra puberla. *Corollae* tubus 8 9 mm. longus, ore dense barbato-pilosus; labium inferius subquadratum, 9 mm. longum, apice 9 mm., basi 5 mm. latum, extra parce breviter pilosum et rubro-glandulosum, 3-lobatum, lobis oblongis integris 3·75 mm. longis 3 mm. latis; labium supremum inferiore multo brevius, lobulis 2 emarginulatis. *Stamina* 2, filamentis brevibus complanatis, antheris maiusculis, staminodiis duobus. *Ovarium* pilis glanduloso-capitatis et praeterea glandulis brunneis densius tectum; stylus pubescens, pilis infimis glanduloso-capitatis.

Described from a specimen raised in Dublin at the Trinity College Botanic Gardens from seed sent from Siam by Dr. A. F. G. Kerr.

Daphniphyllum Beddomei, *Craib* [Euphorbiaceae-Phyllantheae]; a *D. himalayense*, Muell. Arg., foliis fuscis subtus haud glaucis distinguendum.

Arbor circiter 15 m. alta (ex *Kerr*), omnino glabra vel ramulis juventute tantum minutissime sparse puberulis; ramuli primo fusci, plus minusve angulati, mox castanei vel atri, conspicue lenticellati, teretes. *Folia* lanceolata, oblongo-lanceolata vel late oblongo-lanceolata, saepe parum inaequilateralia, apice acuminata, acuta, basi attenuato-cuneata vel cuneata, interdum acuminata, 9-21·5 cm. longa, 3·3–8·4 cm. lata, papyracea vel coriaceo-papyracea, nervis lateralibus utrinque circiter 12 intra marginem anastomosantibus supra prominulis subtus cum costa prominentibus, nervulis pagina utraque subprominulis, margine integra, cartilaginea, recurva, petiolo 2–4 cm. longo supra canaliculato suffulata; stipulae fugaces, 4 mm. longae. *Inflorescentia* ♂ axillaris, 2·2–2·5 cm. longa, glabra, rhachi fusca glabra ima basi perulis paucis interdum persistentibus interdum deciduis instructa; pedicelli 3 mm. longi; bracteae deciduae. *Sepala* 3–4, albida, oblonga quadratave apice irregulariter fimbriata denticulatave, circa 1 mm. longa. *Stamina* 9, filamentis brevibus, antheris crassis angulatis oblongis brevissime vel vix apiculatis. *Inflorescentia* ♀ ignota; infructescentia

circa 5 cm. longa, rhachi ima basi perulata; pedicelli 10–14 mm. longi; bracteae deciduae. *Fructus* vix maturus, ambitu subellipticus, parum compressus, circa 8 mm. longus et 5·75 mm. latus, apice stigmatibus duobus recurvis supra canaliculatis circa 1·25 mm. longis ornatus.

Pa Miang, Chê Sawn, evergreen jungle, 1200 m., *Kerr* 3101 (♂)

Distr. Burma: Amherst, Muleyit, 900 m., *Lace* 5607, *Beddome* (both ♀).

Beddome's plant was doubtfully included under *D. himalayense* in the Flora of British India (vol. v. p. 354).

Boehmeria siamensis, *Craib* [Urticaceae-Urticeae]; a *B. macrophylla*, Don, foliis pro longitudine latioribus haud bullatis distinguenda.

Frutex 2–2·5 m. altus; ramuli juventute parce strigillosi, plus minusve angulati et sulcati, cortice rubro-brunneo parce inconspicue lenticellato obtecti. *Folia* opposita, oblongo-lanceolata vel ovato-lanceolata, apice acuta vel attenuato-subacuminata, basi cuneata vel late cuneata, obtusa, 10-15 cm. longa, 4·5–5·5 cm. lata, chartacea, pagina utraque parce albo-strigillosa, e basi trinervia, nervis duobus lateralibus vix ad apicem excurrentibus cum costa supra subimpressis subtus prominentibus, nervis secondariis (e costa ortis) numerosis infimis fere rectis subpatulis, medianis arcuato-patulis, supremis arcuatis, margine, parte triente inferiore integra excepta, obtuse serrata vel crenato-serrata, petiolo 1–1·8 cm. longo supra canaliculato ut ramulis strigilloso suffulata; stipulae lanceolatae, vix 5 mm. longae, deciduae. *Spicae* ♀ nodo quoque 2–6, ad 9·5 cm. longae, e ramulis anni prioris ortae, parte basali 1–1·5 cm. longa bracteis sterilibus brunneis persistentibus ovatis circa 2·5 mm. longis imbricatis dorso praesertim ad medium breviter adpresse pubescentibus tecta; bracteae fertiles sterilibus similes, multiflorae. *Ovarium* in perianthio 3-lobato parce pubescente inclusum.

Chiengmai, Doi Sutep, 720-800 m., *Kerr* 538, *Hosseus* 455.

XLVIII.—FUNGI EXOTICI: XXI.

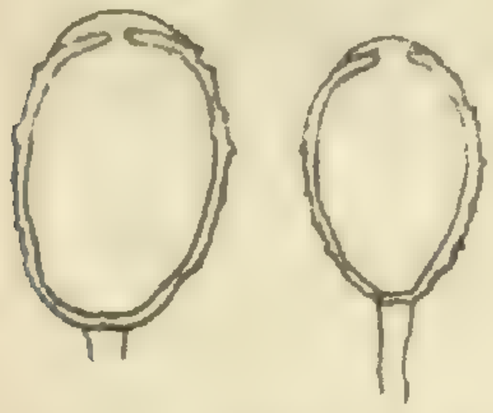
NEW UREDINALES FROM EAST AFRICA.

W. B. Grove.

Uromyces Polygalae, *Grove.*

Sori uredosporiferi amphigeni, sparsi, rotundati, convexi, circa ½–1 mm. diam., epidermide rupta erecta cincti, compactiusculi, dilute brunnei; *uredosporae* globulosae vel ovoideae, 18-20 μ diametro, vel rarius ellipsoideae, usque 24 × 12 μ,

sparse echinulatae, dilute fuscae, poris germationis tribus subaequatorialibus instructae. *Teleutosporae* immixtae, paucae, ellipsoideae vel obovoideae, circa 20–22 × 12–15 μ, verruculosae, brunneae, saepe apice papilla depressa latiore brunneola auctae, episporio 2 μ crasso, pedicello hyalino deciduo sporam subaequante praeditae.



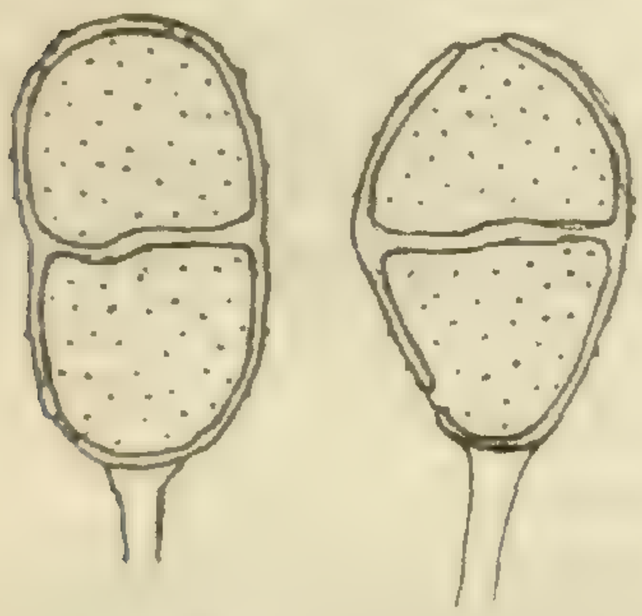
TELEUTOSPORES × 600.

TROPICAL AFRICA. Uganda: Kipayo, 1220 m., March, 1915, *Dummer* 2324, on leaves of *Polygala persicariaefolia* DC., or a related species.

The sori were infested with great numbers of the pycnidia of *Darluca Filum*, Cast.

Puccinia Erlangeae, *Grove.*

Sori teleutosporiferi hypophylli, sparsi, mediocres, 2–3 mm. lati, rotundati vel lineari-oblongi, umbrini, tomento folii plus minusve obtecti, pulverulenti, maculis obscuris insidentes; *teleutosporae* ellipsoideae, utrinque rotundatae, apice non incrassatae, medio non vel lenissime constrictae, laxiuscule verruculosae, pallide brunneae, 32–40 × 22–25 μ, episporio tenuissimo 1–1$\frac{1}{2}$ μ crasso, poro germinationis cellulae superioris juxta apicem, inferioris juxta pedicellum sito, pedicello plerumque curto hyalino deciduo praeditae.



TELEUTOSPORES × 600.

BRITISH EAST AFRICA. Nairobi, Limoru, 2134 m., Feb., 1915. *Dummer* 1745, on leaves of *Erlangea tomentosa.*

This species belongs to the type of *P. Hieracii*, but is remarkable for its very thin wall.

Puccinia exilis, *Syd.* var. **Hibisci,** *Grove.*

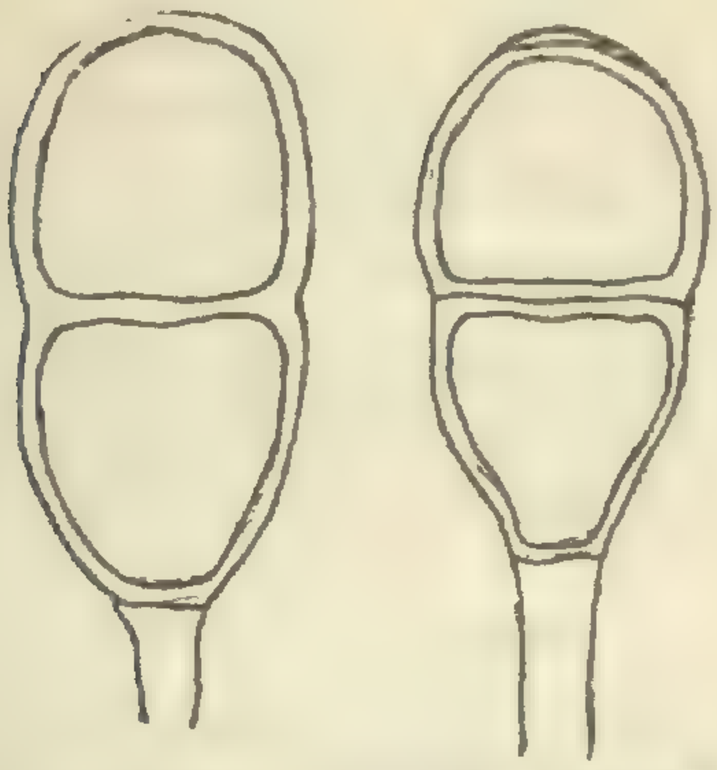
Varietas a typo differt maculis rufidulis, *soris teleutosporiferis* non solitaris, sed 6–12 in quaque macula dense congestis, *teleutosporis* maturis non subhyalinis, at flavo-brunneolis diaphanisque: caetera typi.

TROPICAL AFRICA. Uganda: Kirerema, 1220 m., March, 1915, *Dummer* 2326, on leaves of *Hibiscus* sp. in a swamp.

Puccinia Hoslundiae, *Grove.*

Sori uredosporiferi amphigeni, sine maculis, subgregarii, minuti ($\frac{1}{4}$ mm. diametro), rotundi, pustulati, compacti, prominuli,

pallidi, epidermide cincti; *uredosporae* ellipsoideae, pallidae, subtiliter echinulatae, 22–25 × 18–20 μ, episporio 2 μ crasso; teleutosporae immixtae vel soris conformibus propriis segregatae, obovoideae, utrinque rotundatae, apice non incrassatae, medio vix constrictae, leves, saturate castaneae, 30–38 × 20–22 μ, episporio 2 μ crasso, poris germinationis non conspicuis, pedicello subhyalino curto vel sporam subaequalite praeditae.



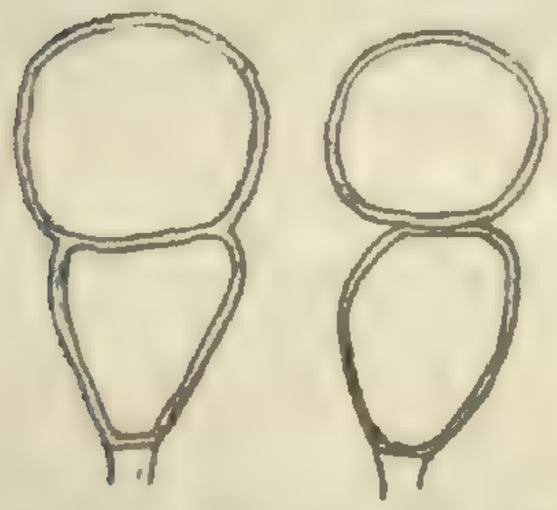
TELEUTOSPORES × 600.

Tropical Africa. Uganda: Maqige, 1220 m., Nov., 1914. *Dummer* 1312, on leaves of *Hoslundia* sp.

This species presents a general resemblance to the smooth form of *P. Menthae*, Pers., but differs from it sufficiently in several details. There is at times a low flat cap covering the apex of the teleutospore, but this is generally wanting.

Puccinia necopina, *Grove.*

Maculae rotundatae, in superiore folii facie conspicuae, 2–5 mm. latae, cinereo-fuscae, purpureo-marginatae. *Sori teleutosporiferi* hypophylli, in maculis ochraceo-fuscis vix marginatis dense congregati, orbiculares, pustulati, $\frac{1}{8}$ mm. diametro, pallide ochracei, epidermide cincti; *teleutosporae* plus minusve clavatae, apice rotundatae vix incrassatae, constrictae, leves, hyalinae, 35–28 × 15–18 μ, pedicello brevi hyalino praeditae, episporio tenuissimo, celulis demum facillime secedentibus.



TELEUTOSPORES × 600.

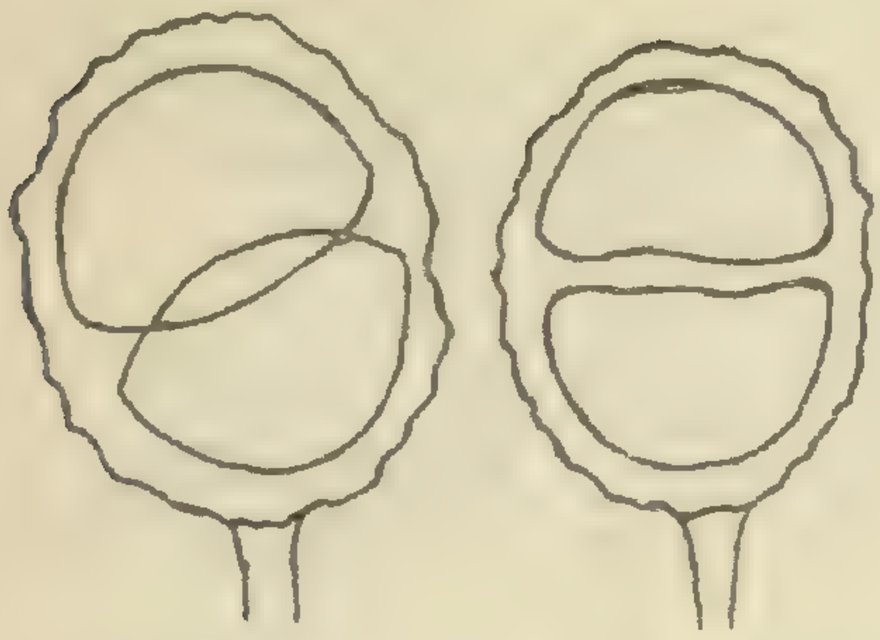
Tropical Africa. Uganda: Kipayo. 1220 m., March, 1915, *Dummer* 2325, on leaves of *Tristemma* sp.

This unusual-looking species occupies the rounded spots of the leaf completely with its very crowded minute pustules. The spots present a different appearance on the two surfaces of the leaf. The spores were mostly empty, having evidently germinated *in situ*, and the outer surface of each pustule was covered with a thick subgelatinous layer, apparently made up of the remains of the decayed basidia. Even when the spores were still full of protoplasm, they were all but perfectly colourless. The species seems to present some similarity to *P. albida*, D. & N., but the spores remind one of those of *P. Saginae*, K. & S., as figured in "British Rust-Fungi," fig. 169.

Puccinia pentadicola, *Grove.*

Sori uredosporiferi hypophylli, sine maculis, sparsi, minuti ($\frac{1}{4}$–$\frac{1}{3}$ μ diametro), punctiformes, pulverulenti, saturate ochracei,

epidermide rupta cincti; *uredosporae* ellipsoideae, leves, flavo-brunneae, 20–23 × 16–18 μ, episporio 1–1½ μ crasso, poris germinationis non visis. *Sori teleutosporiferi* perfecte conformes, atro-brunnei; *teleutosporae* late ellipsoideae, utrinque rotundatae, apice non incrassatae, medio non constrictae, verruculosae, immaturae laete uavae, dein atro-castaneae, 35–45 μ × 28–35 μ, episporia 4 μ crasso, ex tunicis duabus composito, interiore tenui tenaci levi atro-brunnea, exteriore crassa brunneola molliore inaequaliter grosse verrucosa plus minusve secernibili, pedicello gracili hyalino deciduo sporam subaequante saepe oblique inserto praeditae.



TELEUTOSPORES × 600.

TROPICAL AFRICA. Uganda: Mubango, 1220 m., Jan., 1915, *Dummer* 1344, on leaves of *Pentas verticillata*, var. *pubescens*. S. Moore.

This species seems to be intermediate between *P. Pentadis*, Henn. and *P. Pentanisiae*, Cooke, differing from the former in the verruculose external surface of the spore, and from the latter in the hypophyllous sori and thick epispore.

XLIX.—HOST PLANTS OF SYNCHYTRIUM ENDOBIOTICUM.

STUDIES FROM THE PATHOLOGICAL LABORATORY: IV.

A. D. COTTON.

Probably no disease of potatoes is attracting more attention at the present time than Wart Disease or Black Scab, caused by the fungus *Synchytrium endobioticum*, Perc. Although, except for a few isolated spots, it is absent from the south of England, in many of the northern counties and in part of Scotland it causes very serious loss, and in some localities it had become so virulent that a few years ago potato-growing in allotments and gardens had to be practically abandoned. With the discovery, however, of immune varieties potato-cultivation in these areas is being resumed, and the "seed" of high-class resistant varieties is so much in request that the demand at times far exceeds the supply.

The trials carried out at Ormskirk by the Board of Agriculture and Fisheries demonstrate beyond all doubt that certain varieties are not merely highly resistant but, for the present at any rate, absolutely immune to Wart Disease. Disappointment in the past as to immune varieties has been due either to (*a*) wrongly named "seed," or (*b*) to the presence of "rogues," or (*c*) to the use of varieties which, though formerly supposed

to be immune, had not been properly tested on badly and uniformly infected soil. Mr. J. Snell, who is in charge of the Board's experiments in Lancashire, is able to state that no varieties, the resistance of which has been thorougly tested, have as yet broken down in this respect. The existence of varieties resistant to Wart Disease is singularly fortunate for potato growers, as in the case of certain other diseases, Corky Scab for example, all varieties appear to be susceptible.

In spite, however, of the inestimable value of the immune variety it is important to combat the Wart Disease fungus in other ways. Many of the best and most popular potatoes, such as Up-to-Date and King Edward, cannot be grown at all in infected areas. In some districts it is not easy to obtain sufficiently large quantities of resistant seed. whilst it is possible that disease-resistance in certain varieties may break down altogether after some years of cultivation. In addition to this the disease itself is slowly spreading. If it had not been for the vigorous measures enforced by the Board of Agriculture and Fisheries Wart Disease would almost certainly have been distributed by this time throughout the whole of England, but in spite of all precautions it continues to break out in new localities. Every research therefore which throws light on the biology of the fungus is important, as it is only by a complete and accurate knowledge of its life-history that means can be devised for destroying it.

Unlike the ordinary Potato Blight fungus (*Phytophthora infestans*) the Wart Disease organism is almost exclusively subterranean and passes the winter in the soil. No soil-treatment of practical value for killing the "spores" (strictly speaking these are sporangia as they liberate later a number of minute zoospores) has yet been discovered. The sporangia are enclosed in a very thick coat and apparently retain their vitality for a number of years. Many cases are known where Wart Disease has reappeared when clean potatoes have been planted on infected land after an interval of two or three years, and several well authenticated records exist of disease appearing after a six or seven years' interval.

Several explanations of such a recurrence of disease are possible. (1) The disease may have been unconsciously re-introduced by man, animals, water, or other agency. (2) The sporangia may not all germinate the first season but, after the manner of certain seeds, they may remain dormant and germinate irregularly in subsequent seasons. (3) The sporangia may germinate at once and the amœbæ produced from the zoospores may remain alive in the soil either in an amœboid or encysted condition. (4) The fungus may, in the absence of potatoes, have attacked other plants and managed to maintain an existence in their tissues.

Amongst other experimental work on Wart Disease which is being carried out at the Pathological Laboratory at Kew are a series of pot experiments designed to throw light on the above problems. The first explanation suggested above, namely reintroduction, is one for field observation, but for the second and third, material has been collected and a series of experiments

commenced. The results, however, will obviously not be available for several years. The last possibility suggested had often been thought of by growers, and the roots of all kinds of weeds which occur in diseased potato fields had been casually examined for traces of the fungus, but in no case had any excrescences referable to *Synchytrium endobioticum* been found. Definite experiments, however, were desirable.

Of the weeds which belong to the family *Solanaceae* there are only two which would be likely to occur at all frequently in potato plots, namely *Solanum dulcamara*, a wood and hedgerow plant, and *Solanum nigrum*, a common weed in parts of the south of England, and especially in the neighbourhood of London. The latter plant also occurs abundantly in certain Wart Disease areas.

As being the most likely of any to be susceptible to disease, it was decided to test in the first place these two Solanums. Pot experiments were therefore commenced this spring and a few results have already been obtained. Although the investigations are not complete, the results are of some importance and are worthy of record. It is hoped to publish next season a more detailed account. The experiments were as follows:—

Solanum nigrum. Seeds were sown on May 18th in pots of infected soil obtained from Ormskirk, Lancashire. Four pots were sown and the seedlings, which appeared about June 15th, were thinned out to six plants per pot. One pot was examined on August 7th. Four plants out of five were found to possess swellings at the base of the stem, in each of which the sporangia of Wart Disease could be detected with a lens. Sections showed the sporangia to be of the same size and general appearance as in the potato. The warts, though very small only 1–2 mm. thick, were plainly visible when the roots were carefully washed. They occurred in the region of the hypocotyl, and extended over an area of 3 or 4 mm. Details as to their mode of origin and place of infection are reserved till a later paper.

The remaining plants, some 18 in number, were not examined till September 13th, when no excrescences were present, nor, with the exception of one plant, were any sporangia found. In two or three cases the base of the stems had been injured, and it is possible that the injured area may have represented a wounded surface left by a small wart formed by *Synchytrium* which had fallen off.

Four other infected pots into which young seedlings of *Solanum nigrum* from Richmond were planted yielded negative results showing no signs of attack.

Solanum dulcamara. Seeds were sown on May 18th in four pots of infected soil obtained from Ormskirk. The seedlings appeared on June 5th. One pot was examined on August 7th and no sign of Wart Disease was detected. The remainder were examined on September 12th when one plant out of the six was found to possess the sporangia of *Synchytrium endobioticum*. These occurred in the tissues of the outer cortex. Very little or no hypertrophy of the tissues had taken place. The infected area was quite small, but was discernable with a

lens as being darker in colour. No disease was detected on the other plants, but owing to the very small infection which apparently takes place in this plant, it may have been overlooked.

Four plants, the result of dividing an old plant in spring, were also grown. These were examined on September 14th, but no Wart Disease was discovered.

These results show conclusively that Wart Disease is capable of attacking and infecting, though to a moderate extent, both *Solanum nigrum* and *S. dulcamara*. It is therefore quite possible that when attempts are being made to eradicate the disease by discontinuance of potato-growing or by the cultivation only of immune varieties, these two plants may act as hosts for *Synchytrium endobioticum*. The infected area is so small and inconspicuous that they may almost be said to act as "carriers." In actual fact, however, they have in the past probably been of little practical importance in fostering the disease.

Nevertheless, it should be remembered that *Solanum dulcamara* is generally distributed and common in the hedgerows in Britain and was noticed particularly in the hedges around the potato fields in infected districts in Lancashire last summer. *Solanum nigrum*, however, constitutes a greater danger; in the north it is rare, but in some of the Midland districts, where Wart Disease is widespread, it is not infrequent. In response to an inquiry, Mr. H. R. Wakefield kindly informed me that in the infected area of Glamorganshire the weed is locally frequent. and the same probably applies to the neighbouring counties of Carmarthen, Shropshire, and Monmouth. In two isolated areas in Hants and Surrey recently examined, *Solanum nigrum* was a common weed in infected allotments; therefore, any attempt to stamp out Wart Disease in such spots without paying attention to *Solanum nigrum* is not likely to be successful.

From the purely scientific side it is of interest to find that while certain varieties of *Solanum tuberosum* are immune, other species of *Solanum*, not apparently very closely related, are susceptible. This, however, is a well-known phenomenon in the case of fungus diseases of plants.

Of greater interest is the question of the original infection of the potato plant and the possibility of *Synchytrium endobioticum* having spread from wild Solanums to the potato. Wart Disease was first described from Hungary, and it is by no means inconceivable that a minute and hitherto unknown fungus such as *Synchytrium endobioticum* should have passed from wild plants to the cultivated either in that country or in any other where it was endemic.

The contrast between the small amount of hypertrophied tissue found in the woody stems of *Solanum nigrum* and the enormous excrescences developed from the soft parenchyma of the potato tuber is very striking, and may be partly attributable to the difference in the nature of the host tissue. But this factor is perhaps of minor importance, as the nature of the reaction of different host plants to the attack of the same invading parasite is more probably, as is the case with immunity itself, the result of deep-seated chemical differences.

L.—WELWITSCHIA MIRABILIS.

We have received from Professor H. H. W. Pearson, Director of the National Botanic Garden, Kirstenbosch, South Africa, a few weeks before his death, a copy of the S.W. African Protectorate Government Gazette of September 15th, 1916, containing the proclamation making provision for the preservation of *Welwitschia mirabilis*. It is a matter of the greatest satisfaction that it has been found possible under the stress of military occupation to make what we trust will prove adequate provision for the preservation of these unique specimens.

The following is the text of the Proclamation:—

Proclamation.

BY HIS HONOUR EDMOND HOWARD LACAM GORGES, A MEMBER OF THE ROYAL VICTORIAN ORDER, ADMINISTRATOR OF THE PROTECTORATE OF SOUTH-WEST AFRICA IN MILITARY OCCUPATION OF THE UNION FORCES.

No. 10, 1916.]

WHEREAS it is desirable to make provision for the preservation of the Welwitschia plant (Welwitschia mirabilis) (Native name "Garob") which has a known habitat in the locality of Pforte and Welwitsch situated between the Swakop and Khan Rivers in the district of Swakopmund, and in the Namib Desert and in the Kaokofeld, and may occur elsewhere in the Protectorate of South-West Africa;

NOW THEREFORE, under and by virtue of the powers in me vested, I do hereby declare, proclaim and make known as follows:

1. Any person, who, without authority from the Administrator (the burden of proof whereof shall be upon such person), injures, uproots or destroys any Welwitschia plant or removes from any such plant any portion thereof, shall be guilty of an offence.

2. Any person, who, without authority from the Administrator (the burden of proof whereof shall be upon such person) is in possession of any portion of any Welwitschia plant, shall be guilty of an offence, unless he shall have obtained such portion before the date of promulgation hereof.

3. Any person who sells or attempts to sell, or purchases or offers to purchase any Welwitschia plant or any portion thereof shall be guilty of an offence.

4. Any person who causes or procures any other person to do any act prohibited by the preceding provisions of this Proclamation shall be guilty of an offence.

5. Any person found guilty of an offence under the Provisions of this Proclamation shall be liable to a fine of £500 (Five

Hundred pounds) or in default of payment to imprisonment with or without hard labour for a period not exceeding two years.

GOD SAVE THE KING.

Given under my hand at Windhuk this 12th day of September, 1916.

E. H. L. GORGES,
Administrator.

LI.—MISCELLANEOUS NOTES.

Mr. F. A. Stockdale, M.A., F.L.S., Director of Agriculture, Mauritius (*K.B.*, 1912, 392), has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Director of Agriculture, Ceylon, in succession to Mr. R. N. Lyne, resigned.

Mr. H. A. Tempany, D.Sc., Government Chemist and Superintendent of Agriculture for the Leeward Islands, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Director of Agriculture, Mauritius, in succession to Mr. F. A. Stockdale.

Mr. J. H. Holland, F.L.S., and Mr. W. N. Winn, Assistants, Second Class, in the Royal Botanic Gardens, Kew, have been promoted to the grade of Assistant, First Class, with effect from 1st April.

H. H. W. Pearson.—It is with very great sorrow that his friends at Kew have received the intelligence of the death from acute pneumonia of Dr. H. H. W. Pearson, at Mount Royal Hospital, Wynberg, Cape Town, on 3rd November, 1916, in his forty-seventh year. Henry Harold Welch Pearson was born at Long Sutton, Lincolnshire, on 28th January, 1870. His early education was obtained at private schools and by private tuition. In 1889 he matriculated in the University of London. In 1893 he gained an open scholarship of the Clothworkers' Company, tenable either at Oxford or Cambridge, and entered the latter university as a non-collegiate student in October, 1893. He was placed in Class I. of the Natural Science Tripos—Part I.—and graduated B.A. in 1896, entering Christ's College as a pensioner in the same year. In 1897 he was placed in Class I. of the Natural Science Tripos—Part II.—with botany as a special subject, and was elected Foundation Scholar and Darwin Prizeman of Christ's College. In the same year he visited Ceylon as a Wort's Travelling Scholar of the University, spending six months in the island in the study of tropical vegetation, and in pursuing original investigations. On his return to Cambridge in January, 1898, he was appointed Assistant Curator of the University Herbarium under the late Professor Marshall Ward.

F.R.S., and in June of the same year he was elected Frank Smart Student in Botany at Gonville and Caius College.

On 1st March, 1899, he became Assistant for India in the Herbarium at Kew, and in November of that year he was awarded the Walsingham gold medal for original investigations by the University of Cambridge, in which he proceeded to the degree of M.A. in February, 1900. In December, 1900, he was appointed an Assistant on the Kew staff in succession to Mr. I. H. Burkill. In 1903 he was appointed by the South African College Council to the Chair of Botany, now by a new foundation known as the Harry Bolus Professorship, in the South African College, Cape Town (*K.B.* 1903, p. 30). In 1901 he was elected a Fellow of the Linnean Society; in 1907 he proceeded to the degree of Sc.D., Cambridge, and in 1913 he became Honorary Director of the National Botanic Garden at Kirstenbosch, near Cape Town.

Already a young botanist of great promise, Pearson found from the outset of his South African career a congenial field of activity. He entered with zest into the work of botanical exploration, in which field he had already made for himself a reputation that will live along with those which attach to the names of Thunberg, Burchell, Baines and Schinz. His journeys, undertaken with the approval of Government, and in some instances with the assistance of scientific organisations, notably the Percy Sladen Trustees, enabled him to investigate botanically much hitherto unexplored or imperfectly known territory in South-West Africa from Namaqualand to Mossamedes, including more especially the Welwitschia Desert. The singular plant to which this region owes its name was the subject of especial study and afforded material for some of his weightiest contributions to natural knowledge.

During recent years he devoted especial attention to the study of the Cycads. With characteristic energy he brought together at Kirstenbosch living species of this family, and in the words of a South African friend whose appreciation of the deceased was printed in the "Cape Argus" of 4th November, "within three years he had obtained a collection which is second to none in the world." In a letter to a friend now serving at the Front, written a few weeks before his fatal illness, Pearson wrote "the Cycads are increasing in numbers and have reacquired the native dignity of beings that have seen the world make a fool of itself many times and expect to see it again many more times and still remain detached. Almost my greatest satisfaction just now is derived from the contemplation of Cycads."

His interests were, however, exceedingly catholic, so that the results of his labours in the floristic and economic fields have proved as valuable and enduring as those attained in the anatomical and phytogeographical branches of his especial science. As an administrative official he proved himself equally gifted, and the chief service he rendered to the country of his adoption was the part he was able to take in the establishment of the great National Botanic Garden at Kirstenbosch, on the slopes of Table Mountain, the honorary directorship of which was fittingly entrusted to his care. He was also the moving spirit in the

formation of the Botanical Society of South Africa in June, 1913. But not botany alone laments his premature death; the cause of science in South Africa has lost, in Pearson, a wise and devoted friend. "His death," says a South African writer, "occasions a blank which it is practically impossible to fill."

Pearson's outstanding worth came to be recognised in this country as it already was at the Cape; in 1916, he was elected a Fellow of the Royal Society, and his friends at Kew looked forward with confidence to the continuance of a career already distinguished by untiring industry, controlled enthusiasm, singular directness and unfailing tact.

Pearson, in 1902, married Miss E. Pratt, in whose bereavement those at Kew, by whom her late husband was held in such affectionate regard, feel a personal share. His remains were laid to rest on the afternoon of Saturday, 4th November, 1916, in a spot within the garden that he loved, facing the slope devoted to his Cycad plantation. The funeral service was held in the Protea Church, near the Kirstenbosch Estate, and the affectionate regard in which Pearson was held by all associated with the South African College was marked by the cancelling of all college engagements for that day.

The list of contributions here appended, conveys some impression of the varied interests and activities of our old colleague whose memory will endure in the great institution at Kirstenbosch, the establishment and welfare of which he had so much at heart.

List of Publications by the late Prof. H. H. W. Pearson.

Anatomy of the Seedling of *Bowenia spectabilis*, Hook. f. (Ann. Bot. xii. 1898, pp. 475–490, tt. 27–28.)

Apogeotropic Roots of *Bowenia spectabilis*, Hook. f. (Rep. Brit. Assoc. Adv. Sci. 1898, p. 1066.)

Botany of the Ceylon Patanas. Part I. (Journ. Linn. Soc. vol. xxxiv. 1899, pp. 300–365, with map).—Part II., by J. Parkin & H. H. W. P. (l.c. vol. xxxv. 1903, pp. 430–463, tt. 11–12).

S. Hedin's Reisen in Zentralasien. Die botanischen Ergebnisse, bearbeitet von W. Botting Hemsley & H. H. W. P. (Petermann's Geogr. Mitteil. Ergänzungsb. xxviii. 1900, pp. 372–375.)

Description of *Clerodendron Curtisii* (Kew Bulletin, 1901, p. 142).

On a Small Collection of Dried Plants obtained by Sir Martin Conway in the Bolivian Andes, by W. Botting Hemsley & H. H. W. P. (Journ. Linn. Soc. vol. xxxv. 1901, pp. 78–90, with map.)

The Flora of Tibet or High Asia; being a Consolidated Account of the various Tibetan Botanical Collections in the Herbarium of the Royal Gardens, Kew, together with an Exposition of what is known of the Flora of Tibet, by W. Botting Hemsley assisted by H. H. W. P. (Journ. Linn. Soc. vol. xxxv. 1901, pp. 124–265, with map.)

Descriptions of *Cochlearia Hobsoni*, *Geophila pilosa*, *Cuscuta Hygrophilae*, *Pentaphragma albiflorum* and *Vitex mooiensis*. (Hook. Ic. Plant, vol. xxvii. 1900–01, tt. 2643, 2691; vol. xxviii. 1901, tt. 2704–2706.)

Verbenaceae [of South Africa]. (Dyer, Flora Capensis, vol. v. sect. I., 1901 & 1910, pp. 180–226.)

On some Species of *Dischidia* with double Pitchers. (Journ. Linn. Soc. vol. xxxv. 1902, pp. 375–390, t. 9.)

The Teaching of Botany. (Rep. S. African Assoc. Adv. Sci. 1903, pp. 312–316.)

The Double Pitchers of *Dischidia Shelfordii*. (Ann. Bot. vol. xvii. 1903, pp. 617–618.)

South African Verbenaceae. (Trans. S. African Phil. Soc. vol. xv. 1905, pp. 175–182.)

Notes on some South African Cycads. (Rep. S. African Assoc. Adv. Sci. 1905–06, p. 260; Trans. S. African Phil. Soc. vol. xvi. 1906, pp. 341–354, tt. 6–8 & 1 text-fig.)

Some South African Cycads: their habitats, habits and associates. (Rep. Brit. Assoc. Adv. Sci. 1906, pp. 738–739.)

Some Observations on *Welwitschia mirabilis*, Hooker f. (Phil. Trans. R. Soc. B. vol. cxcviii. 1906, pp. 265–304, tt. 18–22.)

Further Observations on *Welwitschia*. (Phil. Trans. R. Soc. Lond. B. vol. cc. 1909, pp. 331–402, tt. 22–30.)—[Abstract.] (Proc. R. Soc. Lond. B. vol. xxx. 1908, pp. 530–531.)

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Preliminary Report on an Investigation of the Life History of the Rooibloem or Witchweed [*Striga lutea*, Lour.]. (Agric. Journ. Union S. Africa, vol. ii. 1911, pp. 266–268.)

On the Rooibloem (Isona or Witchweed). (Agric. Journ. Union S. Africa, vol. iii. 1912, pp. 651–655; Union S. Africa, Dep. Agric. [Leaflet] No. 30, 1912, pp. 1–7.)

The Problem of the Witchweed. (Agric. Journ. S. Africa, vol. vi. 1913, pp. 803–805; Union S. Africa, Dep. Agric. [Leaflet] No. 40, 1913, pp. 1–34, with 9 figs.)

Harry Bolus, D.Sc., F.L.S. [Obituary Notice, with a list of his botanical journeys, by L. Kensit, and a bibliography]. (Rep. S. African Assoc. Adv. Sci. 1911, 69–79, with portrait.)

Through Little Namaqualand with the Vasculum and the Camera. (Gard. Chron. 1911, vol. l. pp. 61–62, 124–125, 166–167, 190–191, 200–201, figs. 30–33, 57-61, 79-81, 89-91. 97–99.)

On the Collections of Dried Plants obtained in South-West Africa by the Percy Sladen Memorial Expeditions, 1908–1911. (Ann. S. African Mus. vol. ix. 1911, pp. 1–19, with map.)

Itinerary of the Percy Sladen Memorial Expedition to the Orange River, 1910–1911. (Ann. S. African Mus. vol. ix. 1911, pp. 21–90, tt. 1–2.)

List of Plants collected in the Percy Sladen Memorial Expeditions, 1908–9, 1910–11. Portulacaceae, by H. H. W. P. & E. L. Stephens. (Ann. S. African Mus. vol. ix. 1912, pp. 30–35.)—Verbenaceae. (l.c. vol. ix. 1913, pp. 183–184.)

Note on the localities visited by the Percy Sladen Memorial Expedition to the Khamiesberg, Giftberg, and Oliphant's River Mountains, September, 1911. (Ann. S. African Mus. vol. ix. 1913, pp. 129–131.)

Le Vaillant's Grotto at Heerenlogement. (Geogr. Journ. vol. xxxix. 1912, pp. 40–47, with sketch-map and 3 figs.)

On the Microsporangium and Microspore of *Gnetum*, with some notes on the Structure of the Inflorescence. (Ann. Bot. vol. xxvi. 1912, pp. 603 620, t. 60 & 6 text-figs.)

The National Botanic Garden [for South Africa]. (Gard. Chron. 1913, liv. pp. 150–151, with sketch map.)

On the Flora of the Great Karasberg. Introduction. (Ann. Bolus Herb. vol. i. 1914, pp. 1–8.)

Observations on the Internal Temperatures of *Euphorbia virosa* and *Aloe dichotoma*. (Ann. Bolus Herb. vol. i. 1914, pp. 41–66.)

Note on the Inflorescence and Flower of *Gnetum*. (Ann. Bolus Herb. vol. i. 1915, pp. 152–172, tt. 24–26.)

Annals of the Bolus Herbarium, edited by H. H. W. P., vols. I.–II., pt. I., 1914–16.

Notes on the Morphology of Certain Structures concerned in Reproduction in the Genus *Gnetum*. (Journ. Linn. Soc. xliii. 1915, pp. 55–56.)

E. G. Kensit.—We regret to record the death of Mr. E. G. Kensit, a member of the staff of the Bolus Herbarium, South African College, since 1912. Mr. Kensit was killed in action on 17th July, at Delville Wood.

The Galpin Herbarium.—From South African newspapers we learn that Mr. E. E. Galpin, F.L.S., an esteemed correspondent of Kew, has presented to the South African Government the valuable collection of South African and other plants formed by him during the past twenty-seven years.

The following particulars of the Galpin Herbarium have been supplied to the "Queenstown Daily Representative" by Mr. I. B. Pole Evans, Chief of the Division of Botany:—

"The Galpin Herbarium comprises the most valuable collection of South African and African plants that has ever been presented to any South African Government. It represents the collection of 27 years, made by Mr. Ernest E. Galpin, of Queenstown, who in March last offered his whole Herbarium with cabinets complete, etc., to this Department, as a donation under the following conditions:—

"1. That suitable provision be made for its housing, preservation and upkeep.

"2. That any botanist shall have access to it for purposes of study within reasonable hours and under proper control.

The Herbarium contains some 16,000 mounted sheets and over 30,000 duplicates. This generous offer was gladly accepted by the Hon. the Minister for Agriculture on behalf of the Union Government."

The herbarium has been deposited in the Botanical Laboratories of the Division of Botany of the Union Department of Agriculture at Pretoria, quarters which we understand are not entirely adequate for the purposes of a herbarium. It is to be hoped that in time it may be possible to provide for Mr. Galpin's munificent and public-spirited gift a building which will not only suffice for the housing of the specimens but will permit of this important collection being consulted by botanists to the extent that its scientific value demands.

Botanical Magazine for October, November and December.—The plants figured are *Rosa Davidii*, Crep. (t. 8679), from China; *Thuranthos macranthum*, C. H. Wright (t. 8680), a South African Squill; *Stapelia Gettleffii*, Pott (t. 8681), from the Transvaal; *Callicarpa Giraldiana*, Hesse (t. 8682), from China; *Dendrobium Palpebrae*, Lindl. (t. 8683), from Burma; *Telopea oreades*, Muell. (t. 8684), the Gippsland Waratah; *Cytisus monspessulanus*, Linn. (t. 8685), from the Mediterranean region; *Clematis afoliata*, J. Buch. (t. 8686), from New Zealand; *Artanema longifolium*, Vatke (t. 8687), a native of tropical Asia and Africa; *Rosa cerasocarpa*, Rolfe (t. 8688), a Chinese species; *Huntleya citrina*, Rolfe (t. 8689), an orchid from Colombia; *Sanguisorba obtusa*, Maxim., var. *amoena*, Jesson (t. 8690), from the mountains of Japan; and *Abies cephalonica*, Loud. (t. 8691), the Silver Fir of Greece.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

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APPENDIX I.—1916.

CONTENTS.

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BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX I.—1916.

LIST OF SEEDS OF HARDY HERBACEOUS PLANTS AND OF TREES AND SHRUBS.

The following is a select list of seeds of Hardy Herbaceous Plants and of Hardy Trees and Shrubs which, for the most part, have ripened at Kew during the year 1915. These seeds are available only for exchange with Botanic Gardens, as well as with regular correspondents of Kew. No application, except from remote colonial possessions, can be entertained after the end of February.

HERBACEOUS PLANTS.

Acaena adscendens.
glauca.
inermis.
macrostemon.
microphylla.
myriophylla.
Novae-Zelandiae.
ovalifolia.

Acanthus longifolius.

Achillea Ageratum.
ageratifolia.
argentea.
grandiflora.
Kellereri.
spinulifera
tomentosa.
Wilczeckii.

Aconitum barbatum.
Lycoctonum.
rostratum.
septentrionale.
uncinatum.
Wilsoni.

Actaea spicata.
— var. rubra.

Adenophora denticulata.
liliifolia.
stylosa.

Adonis amurensis.

Aethionema cappadocicum.
cordatum.
grandiflorum.
iberideum.
pulchellum.
saxatile.

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Agrimonia odorata.
repens.

Agropyron pungens.

Agrostis alba.
elegans.
nebulosa.

Allium cyaneum.
Erdelii.
Fetisowii.
grande.
kansuense.
karataviense.
macranthum.
narcissiflora.
neapolitanum.
odorum.
Ostrowskyanum.
pulchellum.
Schuberti.
subhirsutum.

Alonzoa Warscewiczii.

Alstroemeria aurantiaca.
Ligtu.

Althaea armeniaca.
cannabina.
ficifolia.
kurdica.
pallida.
rosea.

Alyssum argenteum.
creticum.
incanum.
podolicum.
saxatile var. citrinum.
serpyllifolium.
sinuatum.
spinosum.

Amarantus caudatus.
chlorostachys.
hypochondriacus.
polygamus.
retroflexus.

Amellus annuus.

Amethystea coerulea.

Ammobium alatum.

Anacyclus officinarum.

Androsace Henryi,
villosa.

Anemone alpina.
decapetala.
multifida.
japonica var. hupehense.
Pulsatilla.
rivularis.
sylvestris.

Anoda hastata.

Anthemis mixta.
montana.
tinctoria.

Anthericum Liliago.
ramosum.

Antirrhinum Asarina.
glutinosum.
hispanicum.
Orontium.

Apera Spica-Venti.

Aquilegia canadensis.
chrysantha.
coerulea.
glandulosa.
pyrenaica.
truncata.

Arabis arenosa.
hirsuta.
petraea.
verna.

Arctotis stoechadifolia.

Arenaria aretioides.
capillaris.
cephalotes.
foliosa.
gypsophiloides.

Arenaria—*cont.*
grandiflora.
laricifolia.
montana.
pinifolia.
purpurascens.
sajanensis.
Stephaniana.
tetraquetra.

Argemone grandiflora.
hispida.
mexicana.
ochroleuca.

Armeria canescens.
chilensis.
fasciculata.
majellensis.

Arnica amplexicaulis.
Chamissonis.
foliosa.
latifolia.
longifolia.
montana.
sachalinensis.

Artemisia lanata.
parviflora.
scoparia.
Siversiana.

Arthropodium cirrhatum.

Asperula azurea.
ciliata.
galioides.

Asphodeline lutea.

Asphodelus albus.

Aster alpinus.
batangensis.
diplostephioides.
Douglasii.
foliaceus.
glaucus.
Herveyi.
Lipskyi.

Aster—*cont.*
macrophyllus.
multiflorus.
Purdomi.
radula.
subcceruleus.
vestitus.
Vilmorinii.
yunnanense.

Astilbe chinensis.
rivularis.
simplicifolia.
Thunbergii.

Astragalus armeniacus.
chinensis.
frigidus.
Glyciphyllos.
maximus.
pentaglottis.
Sieversianus.
xiphocarpus.

Astrantia Biebersteinii.
helleborifolia.

Anthamanta Matthioli.

Atriplex rosea.

Atropa Belladonna.
lutescens.

Baeria coronaria.

Baptisia australis.

Barbarea arcuata.

Beckmannia erucaeformis.

Bellium crassifolium.

Berkheya Adlami.
purpurea.

Beta Bourgaei.
trigyna.

Bidens leucantha.

Biscutella ciliata.
didyma.
laevigata.

Blumenbachia insignis.
muralis.

Bocconia cordata.
microcarpa.

Brachycome iberidifolia.
— var. alba.

Brachypodium caespitosum.
japonicum.
pinnatum.
sylvaticum.

Brassica campestris.
Cheiranthos.
Erucastrum.
juncea.
rugosa.
Tourneforti.

Brickellia grandiflora.

Briza maxima.
minor.

Bromus adoënsis.
breviaristatus.
carinatus.
ciliatus.
commutatus.
japonicus.
Kalmii.
macrostachys.
marginatus.
maximus.
polyanthus.
rubens.
sitchensis.
squarrosus.
Tacna.
Trinii.
unioloides.

Bulbinella Hookeri.

Bunias orientalis.

Buphthalmum salicifolium.

Bupleurum Candollei.
falcatum.
longifolium.

Cakile maritima.

Calamagrostis confinis.
Epigeios.

Calandrinia speciosa.

Calceolaria mexicana.
polyrrhiza.

Callirhoë involucrata.
lineariloba.
pedata.

Callistephus hortensis.

Camassia Fraseri.
Leichtlinii.
montana.

Camelina sativa.

Campanula alliariaefolia.
ardoinensis.
barbata.
bononiensis.
Cervicaria.
Imeretina.
lactiflora.
lanata.
latifolia.
latiloba.
longistyla.
macrostyla.
patula.
phyctidocalyx.
pulla.
Raddeana.
rhomboidalis.
sarmatica.
Scheuchzeri.
serotina.
sibirica.
speciosa.
spicata.
thyrsoides.
tomentosa.

Capsella grandiflora.

Carbenia benedicta.

Carduus stenolepis
tenuiflorus.

Carex binervis.
laevigata.

Carthamus lanatus.
tinctorius.

Carum copticum.

Catananche coerulea.
lutea.

Cathcartia villosa.

Celmisia grandiflora.
holosericea.
petiolata.

Centaurea axillaris.
dealbata.
macrocephala.
montana.
Phrygia.
pulchra.
rupestris.
ruthenica.

Centranthus Sibthorpii.

Cephalaria alpina.
radiata.

Cerastium Biebersteinii.
macranthum.
ovatum.
tomentosum.

Chaerophyllum aromaticum.
nodosum.

Charieis heterophylla.

Chelone Lyoni.
obliqua.

Chelonopsis moschata.

Chenopodium ambrosoides.
capitatum.
urbicum.

Chlorogalum pomeridianum.

Chorispora tenella.

Chrysanthemum anserinae-
folium.
Balsamita var. tomentosum
carinatum.
caucasicum.
ceratophylloides.
cinerariaefolium.
coronarium.
corymbosum.
Haussknechtii.
Myconis.
pallens.
prealtum.

Chrysopsis villosa.

Cimicifuga cordifolia.
foetida.
racemosa.

Cladium Mariscus.

Clarkia elegans.
pulchella.

Cleome violacea.

Clintonia umbellata.

Cnicus arachnoideus.
syriacus.

Cochlearia glastifolia.

Collinsia bicolor.
grandiflora.
verna.

Collomia coccinea.
gilioides.
grandiflora.

Convolvulus Cupanianus.
farinosus.
tricolor.
undulatus.

Coreopsis lanceolata.

Coriandrum sativum.

Coronilla scorpioides.

Corydalis capnoides.
cheilanthifolia.
glauca.
lutea.
racemosa.
thalictrifolia.

Corynephorus canescens.

Cosmidium Burridgeanum.

Cosmos diversifolius.

Cotula coronopifolia.

Crepis aurea.
blattarioides.
grandiflora.
pygmaea.
rubra.
sibirica.

Crocus asturicus.
aureus
Imperati.
longiflorus.
medius.
pulchellus.
Sieberi.

Crucianella aegyptiaca.

Cynoglossum cheirifolium.
nervosum.
nudiflorum.
Wallichii

Cynosurus echinatus.

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Aschersoniana.

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Dalea Lagopus.

Datisca cannabina.

Datura Tatula.

Delphinium caucasicum.
consolida.
decorum.
Delavayi.
dyctiocarpum.
elatum.
Geyeri.
grandiflorum.
Maackianum.
Menziesii.
occidentale.
pictum.
speciosum.
— var. glabratum.
trolliifolium.
vestitum.

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tenella.

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caesius.
callizonus.
capitatus.
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cruentus.
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dentosus.
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frigidus.
gallicus.
giganteus.
leptopetalus.
neglectus.
pallidiflorus.
petraeus.
Requienii.
Seguieri.
squarrosus.
subacaulis.
superbus.
viscidus.
Waldsteinii.

Dictamnus albus.

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lanata.

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hybrida.
pluvialis.

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atratus.
ferox.
inermis.
plumosus.

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Meadia.

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rectum.

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altaica.
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carinthiaca.
cuspidata.
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nutans.
parviflorum.
peregrinum.

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lanata.

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Eccremocarpus scaber.

Echinacea purpurea.

Echinocystis fabacca.

Echinops dahuricus.
sphaerocephalus.

Elsholtzia cristata.

Elymus giganteus.
virginicus.

Encelia calva.

Epilobium Dodonaei.
linnaeoides.
luteum.
macropus.
nummularifolium.

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robustus.
Tubergeni.

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aurantiacus.
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glaucus.
grandiflorus.
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multiradiatus.
neomexicanus.
salsuginosus.

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macradenum.
malacoides.
Manescavii.

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alpinum.
Bourgati.
giganteum.
glaciale.
multifidum.
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citrinum.
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revolutum.

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lutea.
pallidiflora.
tenella.

Galactites tomentosa.

Galax aphylla.

Galega orientalis.
patula.

Galeopsis Tetrahit.

Galium thymifolium.

Gastridium australe.

Gentiana asclepiadea.
Cruciata.
dahurica.
decumbens.
Freyniana.
macrophylla.
phlogifolia.
septemfida.
straminea.
tibetica.

Geranium albiflorum.
eriostemon.
Fremonti.
grandiflorum.
ibericum.
incisum.
macrorrhizum.
rivulare.
sessiliflorum.
tuberosum.

Gerbera Anandria.

Geum album.
chiloense.
coccineum.
Heldreichii.
montanum.
Rossii.
triflorum.

Gilia achilleaefolia.
androsacea.
capitata.
coronopifolia.

Gilia—*cont.*
densiflora.
liniflora.
micrantha.
multicaulis.
squarrosa.
tricolor.

Gillenia trifoliata.

Glaucium corniculatum.
—var. tricolor.
leiocarpum.

Globularia cordifolia.
vulgaris.

Glyceria distans.

Grindelia cuneifolia.
robusta.

Guizotia oleifera.

Gypsophila acutifolia.
elegans.
Gmelinii.
muralis.
paniculata.
prostrata.
Steveni.

Hastingsia alba.

Hebenstretia tenuifolia.

Hedysarum esculentum.
flavescens.
humile.
Semenovii.

Helenium Bigelovii.
Hoopesii.
tenuifolium.

Helianthemum Tuberaria.

Helianthus Nuttallii.
occidentalis.

Helichrysum bracteatum.

Heliophila pilosa.

Helipterum roseum.

Heracleum persicum.
pyrenaicum.

Herbertia pulchella.

Hesperis matronalis.

Heuchera Drummondi.
foliosa.

Hibiscus Trionum.

Hieracium alpinum.
amplexicaule.
Auricula.
Bornmülleri.
Grisebachii.
Heldreichii.
lanatum.
pannosum.
villosum.

Hilaria rigida.

Hordeum bulbosum.
maritimum.

Horminum pyrenaicum.

Hymenophysa pubescens.

Hyoscyamus albus.

Hypecoum grandiflorum.
procumbens.

Hypericum Ascyrum.
confertum.
Coris.
empetrifolium.
hirsutum.
linarifolium.
nummularium.
olympicum.
tomentosum.

Hypochaeris glabra.
uniflora.

Iberis Amara.
Lagascana.

Impatiens scabrida.

Inula barbata.
brittanica.
ensifolia.
Hookeri.
macrocephala.
orientalis.
racemosa.
Royleana.
spiraeafolia.
squarrosa.

Iris bucharica.
caroliniana.
chrysographis.
dichotoma.
Douglasiana.
Leichtlini.
longipetala.
missouriensis.
setosa.
tectorum.
tingitana.

Isatis glauca.

Jasione perennis.

Juncus alpinus.
Chamissonis.
triglumis.

Jurinia cyanoides.

Kitaibelia vitifolia.

Kniphofia citrina.
Nelsoni.

Kochia trichophila.

Koeleria phleoides.
splendens.

Lactuca Bourgaei.
bracteata.
perennis.

Lagurus ovatus.

Lallemantia canescens.
iberica.

Lasiospermum radiatum.

Lathyrus angulatus.
Aphaca.
articulatus.
cirrhosus.
Clymenum.
grandiflorus.
luteus.
maritimus.
Nissolia.
Ochrus.
pisiformis.
polyanthus.
rotundifolius.
setifolius.
tingitanus.
tuberosus.
undulatus.
variegatus.
venosus.

Laurentia tenella.

Lavatera cachemiriana.

Leontopodium alpinum.

Leptosyne Douglasii.
maritima.
Stillmanni.

Leuzea conifera.
longifolia.

Ligusticum alatum.
pyrenaicum.
scoticum.

Lilium parvum.
pyrenaicum.
sutchuenense.

Limnanthes alba.

Linaria anticaria.
aparinoides.
bipartita.
dalmatica.
macedonica.

Linaria—*cont.*
maroccana.
multipunctata.
sapphirina.
saxatilis.
triphylla.
tristis.
viscida.

Linum angustifolium.
capitatum.
monogynum.
nervosum.
salsoloides.
usitatissimum.

Lobelia sessilifolia.
syphilitica.

Lotus Requienii.
Tetragonolobus.

Lunaria annua.

Lupinus angustifolius.
argenteus.
concinnus.
densiflorus.
Douglasii.
elegans.
Hartwegii.
micranthus.
mutabilis.
nanus.
perennis.
pubescens.

Luzula Hosti.
nivea.

Lychnis alpina.
chalcedonica.
Flos-jovis.
fulgens.
Haageana.
Lagascae.
Preslii.
Sartori.

Lycurus phleoides.

Lysimachia clethroides.
davurica.

Madia dissitiflora.
sativa.

Malcomia africana.
chia.
maritima.

Malope trifida.

Malva Alcea.
oxyloba.
parviflora.

Matthiola bicornis.
sinuata var. glabra albiflora.

Meconopsis aculeata.
cambrica.
heterophylla.
integrifolia.
latifolia.
paniculata.
rudis.
Wallichii.

Medicago Echinus.
Helix.
Murex.
orbicularis.
turbinata.

Melica altissima.
ciliata.

Melilotus alba.

Mimulus cardinalis.
Lewisii.
luteus.
primuloides.

Mirabilis divaricata.
Jalapa.
longiflora.

Molinia coerulea.

Molopospermum cicutarium.

Monarda didyma.
fistulosa.

Monolepis trifida.

Muscari armeniacum.
compactum.
neglectum.
paradoxum.
parviflorum.
pulchellum.

Myosurus minimus.

Myriactis Gmelini.

Nardostachys grandiflora.

Nardus stricta.

Nemesia floribunda.

Nepeta concolor.
discolor.
macrantha.
nuda.

Nicandra physaloides.

Nicotiana affinis.
Langsdorffii.
paniculata.
rustica.
Sanderae.
Tabacum.

Nigella corniculata.
damascena.
hispanica.

Noccaea alpina.

Oenothera amoena.
Cockerellii.
densiflora.
riparia.
rosea.
tenella.
triloba.

Olearia insignis.

Onopordon Acanthium.
arabicum.
bracteatum.

Ornithogalum narbonense.

Oryzopsis miliacea.

Oxyria digyna.

Oxytropis Halleri.
lapponica.
pilosa.

Paeonia arietina.
decora var. alba.
mollis.
paradoxa.
peregrina.
tenuifolia.
Veitchii.

Panicum capillare.

Papaver alpinum.
Argemone.
commutatum.
glaucum.
laevigatum.
lateritium.
nudicaule.
orientale.
pavoninum.
rupifragum.
somniferum.

Paradisia Liliastrum.

Parrya Menziesii.

Patrinia heterophylla.
palmata.

Peltaria alliacea

Pennisetum macrourum.

Pentstemon acuminatus.
arizonicus.
barbatus.
campanulatus.
confertus.
deustus.

Pentstemon—*cont.*
diffusus.
gentianoides.
glaucus.
gracilis.
heterophyllus.
humilis.
isophyllus.
Jamesii.
Menziesii var. Scouleri.
ovatus.
pubescens.
secundiflorus.

Perezia multiflora.

Petunia nyctaginiflora.

Phacelia campanularia.
congesta.
malvaefolia.
tanacetifolia.
viscida.
Whitlavia.

Phalaris minor.
paradoxa.
tuberosa.

Phleum arenarium.
asperum.
Michelii.

Phlomis cashmiriana.
pratensis.
tuberosa.
umbrosa.

Physalis Alkekengi.
Bunyardi.
Francheti.
ixiocarpa.

Physochlaina orientalis.

Physospermum cornubiense.

Physostegia virginiana.

Phyteuma canescens.
Michelii.
orbiculare.
Scheuchzeri.

Phyteuma—*cont.*
serratum.
spicatum.

Phytolacca acinosa.
decandra.

Plantago Candollei.
Coronopus.
Cynops.
maritima.
Myosurus.
ovata.
Psyllium.

Platycodon glaucum.
grandiflorum.
— var. Mariesii.

Platystemon californicus.

Pleurospermum Golaka.

Poa abyssinica.
caesia.
violacea.

Podophyllum Emodi.

Polemonium flavum.
humile.
mexicanum.
pauciflorum.

Polycalymna Stuartii.

Polygonum affine.
alpinum.
Emodi.
Laxmanni.
viviparum.

Polypogon littoralis.
monspeliensis.

Portulaca grandiflora.

Potentilla arguta.
argyrophylla.
calycina.
crinita.
dealbata.
Fenzlii.

Potentilla—*cont.*
glandulosa.
gracilis.
Herbichii.
Hippiana.
Meyeri.
mollis.
montenegrina.
multifida.
nepalensis.
nevadensis.
norvegica.
pennsylvanica.
recta.
rivale.
rupestris.
semilaciniata.
sericea.
tanacetifolia.
Thurberi.

Poterium tenuifolium.

Pratia angulata.

Prenanthes altissima.
purpurea.

Preslia cervina.

Primula angustidens.
Beesiana.
Bulleyana.
capitata.
Fortunei.
frondosa.
involucrata.
Juliae.
lichiangensis.
longiflora.
longiscapa.
malacoides.
mollis.
Palinuri.
Poissoni.
pulverulenta.
saxatilis.
verticillata.
Wardii.

Psoralea acaulis.
macrostachya.
physodes.

Pycnanthemum pilosum.

Ramondia pyrenaica.

Ranunculus chaerophyllus.
Nyssanus.

Raoulia glabra.

Rehmannia angulata.

Reseda virgata.

Rhagadiolus edulis.

Rheum Webbianum.

Rodgersia aesculifolia.
pinnata.
podophylla.

Roemeria hybrida.

Romulea candida.
speciosa.

Rudbeckia amplexicaulis.
californica.
maxima.
speciosus.
subtomentosa.

Rumex maximus.
orientalis.
salicifolius.
sanguineus.

Salvia argentea.
Bertolonii.
carduacea.
Columbariae.
globosa.
glutinosa.
grandiflora.
Horminum.
japonica.
Przewalskyii.
Schiedeana.
Sclarea.
verticillata.
virgata.
viridis.

Sambucus Ebulus.
— var. latifolius.

Sanicula marylandica.

Saponaria ocymoides.
Vaccaria.
Wiemanni.

Saussurea albescens.
alpina.
discolor.
hypoleuca.
salicifolia.

Saxifraga ambigua.
Burseriana.
caespitosa.
cartilaginea.
cernua x granulata.
cochlearis.
— var. minor.
decipiens.
Desoulavyi.
granulata.
Hausmanni.
Hirculus.
lingulata.
— var. lantoscana.
luteo-viridis.
montavoniensis.
mutata.
pedemontana.
rotundifolia.
Sendtneri.
sponhemica.
Stribrnyi.

Scabiosa brachiata.
caucasica var. connata.
fumarioides.
graminifolia.
gramuntia.
Kitaibelii.
longifolia.
Olgae.
Pterocephala.
vestina.

Schizanthus pinnatus.
retusus.

Scilla autumnalis.
verna.

Scopolia lurida.
sinensis

Scorzonera purpurea.

Scrophularia nodosa.
Scorodonia.

Scutellaria altissima.
orientalis.
Tourneforti.

Securigera Coronilla.

Sedum alsinaefolium.
altissimum.
Ewersii.
heterodontum.
kamtschaticum.
maximum.
rariflorum.
rhodanthum.
spathulifolium.
Tatarinowii.
ternatum.

Selinum serbicum.
vaginatum.

Senecio abrotanifolium.
adonidifolium.
alpinus.
Clivorum.
Doronicum.
elegans.
Ledebouri.
Ligularia
squalidus.
stenocephalus.
suaveolens.
tanguticus.
umbrosus.
Wilsonianus.

Serratula atriplicifolia.
Gmelinii.
quinquefolia.
tinctoria.

Seseli elatum.
glaucum.

Sesleria argentea.

Setaria glauca.
italica.

Sidalcea candida.
Listeri.
malvaeflora.
neo-mexicana.

Siderites scordiodes.

Siegesbeckia orientalis.

Silene alpestris.
Armeria.
asterias.
chloraefolia.
ciliata.
colorata.
conoidea.
cretica.
Delavayi.
echinata.
elegans.
Fortunei.
fruticulosa.
italica.
linicola.
longicilia.
melandrioides.
Muscipula.
noctiflora.
nocturna.
paradoxa.
pendula.
quadrifida.
Reichenbachii.
rupestris.
Saxifraga.
Sendtneri.
squamigera.
tatarica.
tenuis.
thessalonica.
vallesia.
verecunda.
Zawadskii.

Silphium Asteriscus.
trifoliatum.

Silybum eburneum.
Marianum.

Sisymbrium strictissimum.

Smyrnium Olusatrum.

Specularia hybrida.
pentagonia.
perfoliata.
Speculum.

Spiraea digitata.
palmata.

Sporobolus cryptandrus.

Stachys Alopecuros.
citrina.
glutinosa.
graeca.
grandiflora.
longifolia.

Statice bellidifolia.
latifolia.
Suwarowii.
tatarica.

Stipa Calamagrostis.
papposa.
pennata.

Swertia Hookeri.
longifolia.
perennis.

Symphyandra Hofmanni.
Wanneri.

Symphytum asperrimum.

Synthyris reniformis.
rotundifolià.

Tellima grandiflora.

Teucrium canadense.
flavum.
multiflorum.
Scorodonia.

Thalictrum angustifolium.
aquilegifolium.
calabricum.
corynellum.

Thalictrum—*cont.*
cultratum.
dioicum.
Fendleri.
squarrosum.

Thermopsis fabacea.
lanceolata.

Thlaspi densiflorum.

Thymus odoratissimus.

Tragopogon balcanicus.

Trautvetteria palmata.

Tricholepis furcata.

Trifolium alpestre.
badium.
elegans.
incarnatum.
Johnstoni.
Lupinaster.
medium.
ochroleucum.
pannonicum.
parviflorum.
physodes.

Trigonella coerulea.
corniculata.
cretica.
polycerata.
radiata.

Trillium grandiflorum.

Trollius altaicus.
asiaticus.
Ledebouri.
sinensis.

Troximon grandiflorum.

Tulipa Batalini.
chrysantha.
dasystemon.
Kaufmanniana.
linifolia.
Sprengeri.

Tunica Saxifraga.

Ursinia pulchra.

Urtica pilulifera.

Valerianella Auricula.
carinata.
coronata.
dentata.
echinata.
eriocarpa.
vesicaria.

Verbascum Blattaria.
gnaphaloides.
Lychnites.
phoeniceum.

Verbena Aubletia.
bonariensis.
erinoides.

Verbesina encelioides.
helianthoides.
Purpusii.

Veronica austriaca.
crassifolia.
gentianoides.
grandis.
incana.
Lyallii.
orientalis.
Ponae.
saxatilis.
spicata.
— var. hybrida.
virginica.
— var. japonica.

Vesicaria sinuata.
utriculata.

Vicia angustifolia.
atropurpurea.
calcarata.
melanops.
Orobus.
pyrenaica.
sicula.
sylvatica.
unijuga.
villosa.

Vincetoxicum fuscatum.

Viola cornuta.
gracilis.
lutea.
palustris.
persicifolia.
Rothomagensis.

Xanthocephalum gymnospermoides.

Zizania aquatica.

Zygadenus elegans.

TREES AND SHRUBS.

Those marked with an asterisk were not grown at Kew.

*Abies Mariesii.
*sachalinensis.
*—var. nemorensis.
*umbellata.
*Veitchii var. olivacea.

Acanthopanax divaricatum.
sessiliflorum.

Acer circinatum.
glabrum.
Heldreichii.
hyrcanum.
insigne.
macrophyllum.
monspessulanum.
nikoense.
opulifolium.
tetramerum.
Trautvetteri.

Adenocarpus foliolosus.

Aesculus californica.
indica.

Ailanthus glandulosa.

Alnus barbata.
cordifolia.
elliptica.
firma.
incana.
japonica.
mollis.
nitida.
oregona.
orientalis.
serrulata.
sitchensis.
Spaethii.
subcordata.
tenuifolia.
— var. Purpusii.
viridis.

Amelanchier asiatica.
florida.
vulgaris.

Aralia chinensis.
— var. pyramidalis.

Arbutus Unedo.

Arctostaphylos Manzanita.

Berberis acuminata.
aggregrata.
angulosa.
Aquifolium.
aristata.
concinna.
Darwinii.
Gagnepainii.
Giraldi.
Hookeri var. viridis.
japonica var. Bealei.
orthobotrys.
pachyacantha.
polyantha.
sanguinea.
sinensis.
Stapfiana.
subcaulialata.
Thunbergii.
umbellata.
Vilmoriniana.
virescens.
Wilsonae.
yunnanense.

Betula.
alnoides var. pyrifolia.
coerulea.
Ermani.
— var. nipponica.
fruticosa.
glandulosa.
humilis.
Kenaica.
lenta.
lutea.

Betula—*cont.*
occidentalis.
papyrifera.
populifolia.
pumila.
utilis var. Jacquemontii.

Bruckenthalia spiculifolia.

Buddleia albiflora.
japonica.
nivea.
variabilis.
— var. Veitchiana.

Calophaca wolgarica.

Calycanthus glaucus.

Caragana arborescens.
— var. Redowskii.
aurantiaca.
decorticans.
frutescens.
microphylla.

Carmichaelia australis.
flagelliformis.

Carpinus caroliniana.
orientalis.
polyneura.

Cassinia fulvida.
Vauvilliersii.

Ceanothus americanus.
azureus.
Fendleri.
integerrimus.
thyrsiflorus.

Cedrus atlantica var. glauca.

Celastrus articulatus.
flagellaris.
scandens.

Celtis occidentalis.

Cephalotaxus drupacea.
Fortuni.
pedunculata.

Cercis Siliquastrum.

Chionanthus virginica.

Cistus albidus.
crispus.
hirsutus.
laurifolius.
platysepalus.
salvifolius.
tauricus.
vaginatus.

Cladothamnus pyrolaeflorus.

Cladrastis amurensis.

Clematis aethusifolia var.
latiscecta.
akebioides.
campaniflora.
connata var. velutina.
Davidiana.
Fargesii.
Flammula.
fusca.
grata.
heracleaefolia.
integrifolia.
intermedia.
ligusticifolia.
mandshurica.
montana.
— var. rubens.
orientalis.
Pitcheri.
Pseudo-flammula.
Rehderiana.
Scottii.
tangutica.
Veitchiana.
vernalis.
virginiana.
Viticella.

Clerodendron Fargesii.
trichotomum.

Clethra alnifolia.
*canescens.

Colutea arborescens.
bullata.

Colutea—*cont.*
cilicica.
longialata.
media.
orientalis.

Coriaria japonica.

Cornus alba.
Amomum.
asperifolia.
Baileyi.
Bretschneideri.
candidissima.
macrophylla.
Nuttallii.
pubescens.
Purpusi.

*Corokia buddleoides.

Cotoneaster acutifolia.
— var. villosula.
affinis.
amoena.
apiculata.
applanata.
bacillaris.
bullata.
buxifolia.
divaricata.
Fontanesii.
foveolata.
Franchetii.
frigida.
Harroviana.
Henryana.
horizontalis.
humifusa.
integerrima.
laxiflora.
Lindleyi.
lucida.
microphylla.
moupinensis.
multiflora.
— var. granatensis.
Nummularia.
obscura.
obtusata.
pannosa.
rotundifolia.
salicifolia var. rugosa.

Cotoneaster—*cont.*
Simonsii.
thymifolia.
tomentosa.
uniflora.
Zabelii.

Crataegus acclivis.
altaica.
atrorubens.
Azarolus.
Boyntonii.
Buckleyi.
canadensis.
Carrierei.
chlorosarca.
coccinea.
cordata.
Crus-galli.
cuneata.
Dippeliana.
dsungarica.
durobrivensis.
elongata.
elliptica.
Ellwangeriana.
flava.
foetida.
Forbesae.
Jackii.
Laurentiana.
lobata.
macracantha.
melanocarpa.
mexicana.
modesta.
mollis.
nigra.
orientalis.
Peckii.
pentagyna.
pentandra.
pinnatifida.
praecox.
prunifolia.
punctata.
tanacetifolia.
tomentosa.
Vailiae.

Cupressus Benthami var.
arizonica.
Goveniana.

Cupressus—*cont.*
Lawsoniana.
nootkatensis.
obtusa.
sempervirens.
— var. retrofracta.
thyoides.
torulosa.

Cydonia Maulei.

Cytisus albus.
biflorus.
capitatus.
decumbens.
Heuffeli.
nigricans.
— var. Carlieri.
praecox.
purgans.
purpureus.
Rochelii.
scoparius var. Andreanus.
— var. flore albo.
sessilifolius.
syriacus.

Daboëcia polifolia.

Daphne Mezereum.
— var. album.

Desmodium cinerascens.
tiliaefolium.

Deutzia corymbosa.
crenata.
cuneata.
discolor var. purpurascens.
globosa.
longifolia.
reflexa.
scabra.
Sieboldiana.
Vilmoriniana.

Diervilla rivularis.
sessilifolia.

Diospyros Lotus.
virginiana.

Dipelta ventricosa.

Elaeagnus multiflora.
umbellata.

Eleutherococcus Henryi.
leucorrhizus.
scaberulus.
Simonii.

Enkianthus campanulatus.
cernuus.
himalaicus.
subsessilis.

Erica cinerea.
Mackaii.
scoparia.
stricta.
Tetralix.

Escallonia Balfourii.
littoralis.
rubra.

Euonymus americanus.
Bungeanus.
latifolius.
oxyphyllus.
planipes.
yedoensis.

Exochorda Alberti.

Fatsia japonica.

Fraxinus Ornus.

Garrya elliptica.

Gaultheria procumbens.
Shallon.

Genista aethnensis.
germanica.
hispanica.
pilosa.
radiata.
sagittalis.
tinctoria.
— var. elatior.
virgata.

Halesia hispida.
tetraptera.

Hamamelis arborea.
japonica.
— var. Zuccariniana.
mollis.

Hedysarum multijugum.

Helianthemum alyssoides.
formosum.
halimifolium.
polifolium.
tuberarium.
villosum.

Hippophaë rhamnoides.

Hydrangea aspera.
Bretschneideri.
cinerea.
petiolaris.
vestita.
xanthoneura.
— var. glabrescens.
— var. Wilsoni.

Hypericum Androsaemum.
Ascyron.
aureum.
Buckleii
elatum.
Hookerianum.
inodorum.
patulum.
— var. Henryi.
Richeri.

Ilex opaca.
Sieboldii.
verticillata.

Indigofera Gerardiana.
macrostachya.

Jamesia americana.

Jasminum fruticans.
humile.

Kalmia cuneata.
glauca.
latifolia.
— var. myrtifolia.

*Larix dahurica var. japonica.
*Principii Rupprechtii.

Laurus nobilis var. angustifolia.

Ledum latifolium.
palustre.

Lespedeza bicolor.

Leycesteria formosa.

Ligustrum Delavayanum.
insulare.
medium.

Lonicera alpigena.
chrysantha.
deflexicalyx.
depressa.
dioica.
gynochlamydea.
Henryi.
hispida.
iberica.
involucrata.
— var. Ledebourii.
Kesselringii.
Maackii.
minutiflora.
Morrowi.
nigra.
obovata.
orientalis.
ovalis.
prostrata.
segreziensis.
Sullivantii.
tatarica.
translucens.
Xylosteum.

Lupinus arboreus.

Lycium chinense var. carnosum.
Grevilleanum.
pallidum.

Lyonia ligustrina.

Magnolia Lennei.
Soulangeana.
tripetala.

Menziesia globularis.

Microglossa albescens.

Myricaria germanica.

Neillia amurensis.
capitata.
opulifolia.
Ramuleyi.
stellata.
Torreyi.

Nesaea salicifolia.

Notospartium Carmichaeliae.

Nuttallia cerasiformis.

Olearia Haastii.

Ononis fruticosa.
rotundifolia.

Paliurus australis.

Pernettya mucronata.

Pertya sinensis.

Petteria ramentacea.

Phellodendron amurense.
chinense.
japonicum.

Philadelphus acuminatus.
brachybotrys.
californicus.
Gordonianus.
hirsutus.
latifolius.
Lewisii.
Magdalenae.
Satsumi.
sericanthus.
tomentosus.
Wilsonii.

Photinia variabilis.

*Picea Glehni.
*Koyamai.

Picrasma quassoides.

Pieris floribunda.
japonica.
mariana.

Pinus contorta.
monticola.
ponderosa.
Strobus.

Piptanthus nepalensis.

Platanus acerofolia.
orientalis.

Potentilla fruticosa.

Prunus acida var. semperflorens.
cornuta.
eminens.
incana.
Maximowiczii.
pennsylvanica.

Ptelea isophylla.
trifoliata.

*Pueraria Thunbergiana.

Pyracantha angustifolia.
coccinea.
crenulata.
Rogersiana.
— var. fructu luteo.

Pyrus alnifolia.
alpina.
americana.
amygdaliformis.
arbutifolia.
crataegifolia.
elaeagrifolia.
hybrida.
intermedia.
lobata.
Meinichii.
microphylla.
minima.

Pyrus—*cont.*
Niedzwetzkyana.
nigra.
pekinensis.
pinnatifida.
prunifolia.
Ringo.
rotundifolia.
salicifolia.
sambucifolia.
Sargentii.
setschwanensis.
sikkimensis.
sorbifolia.
Sorbus.
Toringo.
Torminalis.
yunnanensis.
Zumi.

Raphiolepis japonica.

Rhamnus cathartica.
davurica.
fallax.
Frangula.
spathulifolia.

Rhododendron ambiguum.
californicum.
decorum.
*dilatatum.
discolor.
ferrugineum.
halense.
lepidotum.
longistylum.
lutescens.
maximum.
Metternichii.
— var. angustifolium.
micranthum.
punctatum.
*quinquefolium var. album.
racemosum.
Rhodora.
*rhombicum.
rubiginosum.
*semibarbatum.
siderophyllum.
Vaseyi.
yunnanense.

Rhodotypos kerrioides.

Ribes alpinum.
amictum.
cruentum.
divaricatum.
holosericeum.
robustum.
rotundifolium.

Robinia Kelseyi.

*Rosa alpina.
Fendleri.
coruscans.
Davidii.
Helenae.
lucens.
macrophylla.
microphylla.
pisocarpa.
rubrifolia.
Seraphinii.
sericea.
sertata.
setipoda.
Soulieana.
Webbiana.
Woodsii.

Rubus adenophorus.
biflorus var. quinqueflorus.
coreanus.
flosculosus.
Giraldianus.
inopertus.
lasiostylus.
— var. dizygos.
mesogaeus.
nigro-baccus.
nutkanus.
occidentalis.
omiensis.
parvifolius.
phoenicollasius.
pubescens.
Swinhoei.
thibetanus.
Thunbergi var. glabellus.
trianthus.
Veitchii.
vicarius.
xanthocarpus.

Ruta graveolens.

*Schizophragma hydrangeoides.

Sciadopitys verticillata.

Securinega fluggeoides.
ramiflora.

*Sequoia gigantea.
*sempervirens.

Skimmia japonica.
Laureola.

Smilax Sieboldi.

Sophora viciifolia.

Spartium junceum.

Spiraea Aitchisoni.
arborea.
— var. glabrata.
arcuata.
betulifolia.
brachybotrys.
canescens.
discolor.
expansa.
fastigiata.
japonica.
laevigata.
Lindleyi.
Nobleana.
salicifolia.
trilobata.
Veitchii.
Wilsonii.

Staphylea colchica.
Coulombieri.
pinnata.
trifolia.

Stranvaesia undulata.

Styrax japonicum.
Obassia.

Symphoricarpus Heyeri.
mollis.
racemosus.

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pekinensis.
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cordata.
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OF
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APPENDIX II.—1916.

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OF

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APPENDIX II.—1916.

NOTE.

In the preface to the *Catalogue of the Library of the Royal Botanic Gardens*, which was issued as Volume III. of the *Additional Series* of the *Kew Bulletin*, it was stated that annual lists of future additions would be published in the *Bulletin*.

The present instalment contains the additions made to the Library by gift or purchase during the year 1915, with the exception of such current periodicals and annuals as continue sets already catalogued.

Like the Catalogue, the List is printed on one side of the page to allow of its being cut up. It is probable that many persons and institutions will make the Kew Catalogue the basis of their own, and will use the lists of additions to supply printed slips for fresh titles.

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Alderwerelt van Rosenburgh, C.R.W.K. van. Malayan Fern Allies. Handbook to the determination of the Fern Allies of the Malayan Islands, &c. (Dep. Agric., Netherlands India). Batavia, 1915. 8vo.

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Continued on p. 3 *of cover.*]

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX III.—1916.

NEW GARDEN PLANTS OF THE YEAR 1915.

The number of garden plants annually described in botanical and horticultural publications, both English and foreign, is now so considerable that it is thought desirable to publish a descriptive list of them in the *Kew Bulletin* each year. The following list comprises the new introductions recorded during 1915. These lists are indispensable to the maintenance of a correct nomenclature, especially in the smaller botanical establishments in correspondence with Kew, which are, as a rule, only scantily provided with horticultural periodicals. Such a list will also afford information respecting new plants under cultivation at this establishment, many of which will be distributed from it in the regular course of exchange with other botanic gardens.

The present list includes not only plants brought into cultivation for the first time during 1915, but the most noteworthy of those which have been re-introduced after being lost from cultivation. Other plants included in the list may have been in gardens for several years, but either were not described or their names had not been authenticated until recently.

In addition to species and well-marked varieties, hybrids, whether introduced or of garden origin, have been included where they have been described with formal botanical names. Mere cultural forms of well-known garden plants are omitted, for obvious reasons.

In every case the plant is cited under its published name, although some of the names are doubtfully correct. Where, however, a correction has appeared desirable, this is made.

The name of the person in whose collection the plant was first noticed or described is given where known.

An asterisk is prefixed to all those plants of which examples are in cultivation at Kew.

The publications from which this list is compiled, with the abbreviations used to indicate them, are as follows:—*Bees, Cat.*—Bees, Ltd., Catalogue of Hardy Plants. *B.M.*—Botanical Magazine.

(4492.) Wt. 71–728. 1,125. 8/16. J. T. & S., Ltd. G. 14.

B. M. H. N.—Bulletin du Muséum d'Histoire Naturelle, Paris. *B. T. O.*—Bullettino della R. Società Toscana di Orticultura. *Gard.*—The Garden. *G. C.*—Gardeners' Chronicle. *Gfl.*—Gartenflora. *G. M.*—Gardeners' Magazine. *Jard.*—Le Jardin. *J. of H.*—Journal of Horticulture. *J. H. F.*—Journal de la Société Nationale d'Horticulture de France. *J. R. H. S.*—Journal of the Royal Horticultural Society. *K. B.*—Bulletin of Miscellaneous Information, Royal Botanic Gardens, Kew. *Lemoine, Cat.*—Lemoine, Catalogue. *N. B. G. Edinb.*—Notes from the Royal Botanic Garden, Edinburgh. *O. R.*—Orchid Review. *Orchis.*—Orchis. Beilage zur Gartenflora. *O. W.*—The Orchid World. *Pl. Wils.*—Plantae Wilsonianae, edited by C. S. Sargent. *R. H.*—Revue Horticole.

The abbreviations in the descriptions of the plants are:—*diam.*—Diameter. *ft.*—Foot or Feet. *G.*—Greenhouse. *H.*—Hardy. *H.H.*—Half-hardy. *in.*—Inches. *S.*—Stove.

***Achillea Obristii.** (*Gard.* 1915, 315, f.) Compositae. H. A hybrid probably derived from *A. umbellata*. It has a dwarf habit, silvery foliage and white flowers. (Kew.)

Acnistus Miersii. (*G. C.* 1915, lvii. 58, f. 18.) Solanaceae. G. or H.H. A shrub with large obovate-oblong ornamental leaves and shortly stalked unattractive white flowers about ¼ in. long and broad, borne in fascicles. Corolla deeply 5-lobed. Brazil. (F. Denis, Balarac-les-Bains, Hérault, France.)

Aerides Jarckianum. (*Orchis*, 1915, 53, t. 5, ff. 15-21.) Orchidaceae. S. Plant about 8 in. high. Leaves similar to those of *Rhynchostylis retusa* but broader and less keeled. Raceme slightly decurved, about 10 in. long, densely flowered. flowers ascending or suberect, glabrous, rose-coloured, about 5 in. across. Philippine Islands. (W. Schmidt, Leipzig.)

***Aethionema schistosum.** (*G. C.* 1915, lviii. 34.) Cruciferae. H. An erect-growing plant about 9 or 10 in. high, with narrow glaucous leaves and heads of white and rose flowers. It differs in habit from *A. pulchellum* and blooms later. Asia Minor. (S. Arnott.)

***Aloe Dawei.** (*G. C.* 1915, lvii. 264.) Liliaceae. G. Stems simple, about 6 ft. high. Leaves sword-shaped, 16–18 in. long, 2½–3 in. broad at the base, gradually acuminate, sinuate-dentate. Peduncle stout. Inflorescence branched, rather loose, the racemes up to 5 in. long. Flowers pendulous, red. Uganda. (Lady Hanbury, La Mortola, Italy.)

***Alpinia mutica.** (*B. M.* t. 8621.) Scitamineae. S. This is the true plant which was first introduced about 1810, but which appears to have been lost from British gardens for many years, while other species in cultivation have been erroneously identified with it. It may be distinguished from the plant figured as *A. mutica* in *B. M.* t. 6908 in having much less stout flower-buds and a distinctly 3-lobed labellum. Malaya. (Kew.)

Anemone Mallenderi. (*G. C.* 1915, lvii. 282.) Ranunculaceae. H. Supposed to be a garden hybrid between *A. Pulsatilla* and *A. montana rubra*. (Mallender.)

***Anemone obtusiloba, f. patula.** (*B. M.* t. 8636.) H.? Distinguished from the type by the long decumbent flowering-branches and the ascending peduncles. Flowers purplish-blue, 1¼–1½ in. across. Western Burma. (Glasnevin B. G.)

***Angraecum fimbriatum.** (*G. C.* 1915, lvii. 144.) Orchidaceae. S. Allied to *A. bicaudatum*, but it has larger flowers with a proportionately much larger lip. Leaves linear, 5–6 in. long, about ⅓ in. broad, unequally 2-lobed at the apex. Inflorescence pendulous, with as many as 48 semi-transparent silver-white flowers nearly 1 in. across. Sepals and petals lanceolate, curved forward. Lip broad with fimbriate sides, apiculate at the apex. East Tropical Africa. (Hon. N. C. Rothschild.)

Anguloa Rolfei. (*G. C.* 1915, lviii. 130; *O. R.* 1915, 255, 392.) Orchidaceae. S. Natural hybrid between

A. Rückeri and *A. brevilabris*. (F. Sander and Sons.)

Arundinaria vagans. (*K. B.* 1915, 350. Gramineae. H. A dwarf species quickly forming dense thickets of about 3 ft. high. It has long been in cultivation under the names of *A. pygmaea* and *Bambusa pygmaea*. Probably Japan.

Astragalus Englerianus. (*N. B. G. Edinb.* viii. 259.) Leguminosae. H. An undershrub growing to a height of about 3 ft. Leaves up to 6 in. long, sparingly white-pilose; leaflets in 13–17 pairs, oblong-elliptic, ¾–1 in. long, ¼–¾ in. broad. Flowers small, yellowish, in rather short somewhat lax racemes. See *Engl. Bot. Jahrb.* xxxvi. *Beibl.* 82, 60. Yunnan, China. (Kew.)

Astragalus Purdomii. (*N. B. G. Edinb.* viii. 245.) H. A new species allied to *A. mongholicus*, from which it differs in the bibracteolate calyx and the purplish flowers. It is an erect herb with leaves rather more than 3 in. long; leaflets in about 15 pairs, ovate or oblong. Racemes 6–7-flowered. Corolla much longer than the calyx-tube; standard broadly obvate, about ¾ in. long and ½ in. broad. North China. (J. Veitch & Sons.)

Batemannia Wolteriana. (*Orchis*, 1915, 28, 52, t. 5, ff. 7–14.) Orchidaceae. S. Pseudobulbs ovoid, 2–2½ in. long, more or less 4-angled, 2-leaved. Leaves erect-spreading, lanceolate-elliptic, about 8 in. long, 1¾ in. broad. Inflorescence suberect, 1- or few-flowered. Flowers similar to those of *B. Colleyi*, but larger. Sepals and petals brownish-rose-red, with white tips and margins. Lip whitish, lightly suffused with rose-red. Peru. (P. Wolter, Magdeburg, Germany.)

Begonia Perrieri. (*R. H.* 1914–15, 500; *G. C.* 1915, lviii. 309.) Begoniaceae. S. A new suffrutescent species with decorative foliage. Plant glabrous except on the upper surface of the leaves. Stem erect, 4–8 in. high. Leaves deciduous; blade 6–8 in. long and about as broad, golden-yellow or yellow-bronze to dark green with red-violet veins above, red-violet beneath; petiole 6–8 in. long. Flowers white, small. Fruit unequally 3-winged. Madagascar. (Paris B. G.)

Berberis elegans. (*Bees, Cat.* No. 48, 1914–15. 7; *N. B. G. Edinb.* vii. 110.) Berberidaceae. H. A dwarf compact spinous shrub 10 in.–4 ft. high. Flowers yellow or golden, relatively large, fragrant, very freely produced. Yunnan, China. (Bees, Ltd.)

Brasso-cattleya Cliftonii albens. (*G. C.* 1915, lvii. 47, 108, t.) Orchidaceae. S. Flowers white with a slight lilac tint on the reverse of the sepals and a pale yellow disc. (J. Gurney Fowler.)

Brasso-cattleya Dianae. (*J. H. F.* 1915, 156.) S. Garden hybrid between *B.-c. Orpheus* and *Cattleya Mendelii*. (Ch. Maron & Son, Brunoy, Seine-et-Oise, France.)

Bryocarpum himalaicum. (*N. B. G. Edinb.* ix. 56.) Primulaceae. H.? Leaves petiolate, ovate, arising within a sheath of scales. Scape long, ebracteate, bearing a large solitary oblique yellow flower with 5–8 parts to both calyx and corolla and 5–8 stamens. Calyx-segments long and narrow. Corolla-tube funnel-shaped, rather longer than the calyx, lobes about as long as the tube, oblong, narrow, emarginate. Eastern Himalaya. (Edinburgh B. G.?)

Buddleia Forrestii. (*N. B. G. Edinb.* v. 249; *Bees, Cat.* No. 48, 1914–15, 7.) Loganiaceae. H. Allied to *B. Colvillei*. It is a handsome shrub, 4–15 ft. high, with lanceolate or oblanceolate shortly stalked leaves clothed on the underside with a pale cinnamon-coloured tomentum, and very fragrant pale lilac or reddish-maroon flowers in long elegant spikes. Western China. (Bees, Ltd.)

Buddleia Lindleyana sinuatodentata. (*Lemoine, Cat.* 1915, no. 188, 3.) H.H. Flowers in long spikes, very dark violet, with nearly black tubes. (V. Lemoine & Son, Nancy.)

Bulbophyllum Balfourianum. (*G. C.* 1915, lviii. 56, f. 18; *O. R.* 1915, 247, 256.) Orchidaceae. S. A new species closely resembling *B. Fletcherianum*, especially in habit, and in the texture and colour of its flowers, which, however, are very different in form. Inflorescence a short raceme, few-flowered. Sepals 1½ in. long, about 1 in. broad, the 2 lateral ones curved and connate for part of their length, but with the tips free and divergent. The flowers resemble those of some Stapelias and have a similar odour. New Guinea. (F. Sander & Sons.)

Bulbophyllum inopinatum. (*N. B. G. Edinb.* viii. 346.) S. A new species near *B. nudiscapum*, from which it differs in the black-purple suborbicular long-ciliate petals. It has

many-flowered spikes borne on scapes up to 20 in. long. Sepals ovate-lanceolate, 4 4½ in. long, green with purple-brown lines. Petals only about ½ lin. across. Lip very mobile, linear-lanceolate, about ¼ in. long, black-purple. Probably West Tropical Africa. (Edinburgh B. G.)

***Camarotis obtusa.** (*O. R.* 1915, 223.) Orchidaceae. S. Somewhat like *C. purpurea*, but it has drooping spikes of light rosy flowers with a large orange-coloured crest on the lip. Himalayas. (Kew.)

Campanula pusilla pubescens. (*G. C.* 1915, lviii. 28.) Campanulaceae. H. A pubescent form. (G. Reuthe.)

Catasetum cruciatum. (*Orchis*, 1915, 29.) Orchidaceae. S. Flowers almost 5 in. across, with narrowly ligulate almost black-violet-brown sepals, which are dotted with yellow-green and spread laterally, petals similar, but brownish-green with dark spots, and a broadly oval recurved lip, finely ciliate on the margin and of a yellow-brown colour spotted with dark purple. Peru. (Baron von Fürstenberg, Hugenpoet, near Mintard-on-Ruhr, Germany.)

Catasetum Wredeanum. (*Orchis*, 1915, 17, ff. 3–4.) S. A new species very similar in habit to *C. fimbriatum*, with pseudobulbs and leaves of about the same size as in that species, but with larger much more richly coloured glabrous flowers. Scape 10–12-flowered, 1 ft. high or more. Sepals oblong, acuminate, 1¾ in. long. Petals elliptic, about as long as the sepals. Lip broadly helmet-shaped. Bolivia. (P. Wrede, Dahlem, Berlin.)

Cattleya Bourdasii. (*G. C.* 1915, lviii. 393; *O. W.* vi. 55.) Orchidaceae. G. Garden hybrid between *C. Germania* and *C. Hardyana*. (H. S. Goodson.)

Cattleya Furleyana. (*G. C.* 1915, lviii. 393; *O. W.* vi. 55.) G. Garden hybrid between *C. Harrisoniana* and *C. Rhoda*. (C. J. Phillips.)

Cattleya illustris. (*G. C.* 1915, lviii. 393.) G. Garden hybrid between *C. Acis* and *C. iridescens*. (Armstrong & Brown.)

Cattleya Mossiae pleasingtonense. (*G. C.* 1915, lviii. 31.) G. Sepals and petals white. Lip with yellow lines in the throat. (T. Butler.)

***Ceanothus rigidus,** var. **pallens.** (*K. B.* 1915, 380, with ff.) Rhamnaceae. H. Differs from the type, for which it has often been cultivated, by its longer more strictly cuneate and more conspicuously toothed leaves, larger inflorescences with longer rhachis and pedicels, and paler flowers. California.

Ceropegia Sandersonii × Monteiroae. (*G. C.* 1915, lviii. 348.) Asclepiadaceae. S. Garden hybrid. (H. J. Elwes.)

Chaenomeles lagenaria, var. **Wilsonii.** See **Cydonia Mallardii.**

Cheirostylis Goldschmidtiana. (*Orchis*, 1915, 4, t. 1, ff. 1–7.) Orchidaceae. S. A new species allied to *C. parvifolia*, from which it differs in having many fewer and smaller flowers in its inflorescences and in the relatively shorter and broader blade of the lip. Flowers rather small, white. Penang. (H. Goldschmidt, Essen-on-Ruhr, Germany.)

***Clematis alpina,** var. **carunculosa.** (*R. H.* 1914–15, 534, f. 162.) Ranunculaceae. H. Much more robust than the typical form, the climbing stems reaching a length of 16–20 ft. Flowers abundant, large, pendulous, yellow. Corea. (M. L. de Vilmorin, Verrières-le-Buisson, Seine-et-Oise, France.)

***Clematis aphylla.** (*G. C.* 1915, lvii. 268.) G. Stems 9–10 ft. long, wiry, green, leafless. Leaves represented by stiff petioles. Flowers in auxillary clusters of 4–6, greenish-yellow, about 1 in. across, on pedicels 1½ in. long. New Zealand. (Miss Willmott.) [=*C. afoliata*, Buch.]

Clematis pterantha. (*Bees, Cat.* No. 48, 1914–15, 7.) H. A robust species growing to a height of from 12 to 15 ft. in one season. Stems and leaves tinged with reddish-purple. Leaves 3-foliate; leaflets ovate, 3–5 in. long, coarsely toothed. Flowers produced in great numbers at every joint, rosy pink, about 1 in. across; sepals 4, ovate, provided on the back with 3 membranous wings. The plant flowers from September to November. See *Hook. Ic. Pl.* t. 2713. Yunnan, China. (Bees, Ltd.)

***Clematis uncinata,** f. **retusa.** (*B. M.* t. 8633.) H.H. A graceful climbing shrub. Leaves pinnately 5- or 7-foliolate, those of the inflorescence 3-foliolate or simple; leaflets elliptic or broadly ovate, retuse, glabrous, 1¼–2½ in. long, ¾–1¾ in. broad. Inflorescence leafy. Flowers

fragrant. Sepals 4, white, narrowly oblong, ⅜–¾ in. long. Distinguished from the type by its leafy inflorescence and retuse leaflets. Central China. (Capt. D. V. Pirie, Château de Varennes, Angers, France.) [The typical form is in cultivation, having been introduced by Messrs J. Veitch & Sons in 1901. See *Bean, Trees and Shrubs*, i. 367.]

Coelogyne Beyrodtiana. (*Orchis*, 1915, 90, t. 6, ff. 1–7.) Orchidaceae. S. A new species allied to *C. sulphurea*, which it resembles in pseudobulbs and leaves, but it differs in having a sickle-shaped instead of an erect raceme, and its bracts are quickly deciduous. Flowers somewhat larger, pure white, with 3 ochre-yellow spots on the lip. Perak. (O. Beyrodt, Marienfelde, Berlin.)

Coelogyne gattonensis. (*G. C.* 1915, lviii. 393.) S. Garden hybrid between *C. speciosa* and *C. Sanderae*. (Sir J. Colman, Bart.)

Coelogyne pulverula. (*Orchis*, 1915, 170.) S. Similar to *C. Massangeana* in habit, but the lip of the brownish-white flowers has only 2 instead of 3 crests. Sumatra. (Baron von Fürstenberg, Hugenpoet, near Mintard-on-Ruhr, Germany.)

Coelogyne sumatrana. (*Orchis*, 1915, 206, f. 33.) S. A close ally of *C. testacea*, differing in the colour of the flowers, which are a peculiar brownish-green with brown marks on the lip, in having narrower petals and almost square side lobes to the lip. Sumatra. (Baron von Fürstenberg; O. Beyrodt, Marienfelde, Berlin.)

Coprosma propinqua. (*G. C.* 1915, lviii. 119.) Rubiaceae. H. or H.H. A straggling bush 4–5 ft. high with white berries. New Zealand. (Sir John Ross of Bladensburg.) [The true *C. propinqua* has linear to linear-obovate leaves ¼–½ in. long, insignificant flowers, and globose or broadly oblong bluish to black berries ⅛ in. long. See *Cheeseman, Man. New Zeal. Fl.* 258.]

Cotyledon simplicifolia. (*G. C.* 1915, lvii. 333.) Crassulaceae. G.? "This species has a branched inflorescence about 9 in. high, with, generally, 3 drooping racemes of small yellow flowers, each resembling a miniature *Laburnum* truss. The foliage is small and characteristic of the genus." Country not stated. (Miss Willmott.)

Crocus pulchellus albus. (*G. C.* 1915, lviii. 252.) Iridaceae. H. Flowers small, milk-white, golden at the base. (Barr & Sons; G. Reuthe.)

Crybe rosea. (*Orchis*, 1915, 93, t. 7, ff. 8–15.) Orchidaceae. G. Resembles in habit some of the species of *Bletia*. Pseudobulbs ovoid, about as large as a walnut, bearing at the summit 3 or 4 lanceolate acuminate leaves up to 10 in. long and ¾ 1½ in. broad. Peduncle slender, 16–20 in. long, loosely 5-7-flowered. Flowers about 2 in. long, pendulous, club-shaped, opening only slightly, whitish-green and purple. A re-introduction. It was in cultivation in 1836. See *Bot. Reg.* t. 1872. Mexico. (Darmstadt B. G.)

Cydonia Mallardii. (*G. C.* 1915, lviii. 158; *G. M.* 1915, 439.) Rosaceae. H. Plant about 12 ft. high or more with a distinct pyramidal habit, narrow willow-like leaves and numerous bluish-green lemon-shaped fruits borne close to the main stem. China. (Hon. Vicary Gibbs.) [= *Chaenomeles lagenaria*, var. *Wilsonii*, Rehd. in Pl. Wils. ii. 298.]

Cymbidium albanense. (*G. C.* 1915, lviii. 393.) Orchidaceae. G. Garden hybrid between *C. erythrostylum* and *C. insigne Sanderi*. (F. Sander & Sons.)

Cymbidium Alexanderi albens. (*G. C.* 1915, lvii. 26, f. 6.) G. Flowers pure white except a light rose band near the margin of the lip. (J. & A. McBean.)

Cymbidium Floryi. (*G. C.* 1915, lvii. 39; *O. W.* v. 114.) G. Garden hybrid between *C. grandiflorum* and *C. eburneo-Lowianum*. (Flory & Black.)

Cymbidium insigne album. (*O. R.* 1915, 160; *O. W.* v. 172.) S. Flowers ivory-white, with indistinct greenish-yellow markings on the lip. (P. Smith.)

Cymbidium sandhurstiense. (*G. C.* 1915, lviii. 188.) G. Garden hybrid between *C. Wiganianum* and *C. erythrostylum*. (Armstrong & Brown.)

Cypripedium Curtisii Sanderae. (*G. C.* 1915, lvii. 334, 338, f. 114; *O. R.* 1915, 225.) Orchidaceae. S. A very fine albino form, having the dorsal sepal pure white with bright green lines, petals white, marked with green on the lower half, and lip primrose colour with a pale green tinge in front. (F. Sander & Son.) [*Paphiopedilum*.]

Cypripedium Dupreanum. (*G. C.* 1915, lviii. 393.) G. Garden hybrid

between *C. Troilus* and *C. fulshawense*. (Armstrong & Brown.) [*Paphiopedilum.*]

Cypripedium elatum. (*G. C.* 1915, lviii. 393.) G. Garden hybrid between *C. Ruby Gem* and *C. insigne Harefield Hall.* (Armstrong & Brown.) [*Paphiopedilum.*]

Cypripedium Kelleyi. (*G. C.* 1915, lvii. 39.) S. Garden hybrid between *C. Gigas magnificum* and *C. Fairrieanum*? (R. W. Rickards.) [*Paphiopedilum.*]

Cypripedium micans. (*G. C.* 1915, lviii. 393.) G. Garden hybrid between *C. Clio* and *C. Mrs. Wm. Mostyn.* (Armstrong & Brown.) [*Paphiopedilum.*]

Cypripedium papuanum. (*G. C.* 1915, lviii. 131, f. 43.) S. A small plant 8–10 in. high. Leaves few, thick and leathery, tessellated, oblong, 2½–4 in. long, ¾–1 in. broad. Scape 6-8½ in. long to the base of the bract, 1-flowered. Flower rather dull crimson, tinged with green or greenish-yellow. United lateral sepals elliptic-lanceolate, subacute, ¾ in. long, ⅓ in. broad. Petals oblong, 1⅔ in. long, ½ in. broad. Lip 1½ in. long. Dutch New Guinea. (Hon. N. C. Rothschild.) [*Paphiopedilum.*]

Cypripedium swintonense. (*O. W.* v. 162.) S. Garden hybrid between *C. Hera Euryades* and *C. Earl of Tankerville.* (B. J. Beckton.) [*Paphiopedilum.*]

Cypripedium Vashtii. (*G. C.* 1915, lvii. 36; *O. R.* 1915, 59.) S. Garden hybrid between *C. Adrastus Mariae* and *C. Leeanum giganteum.* (W. R. Lee.) [*Paphiopedilum.*]

***Daphne arbuscula.** (*G. C.* 1915, lvii. 268, f. 84; *Gard.* 1915, 260, f.) Thymelaeaceae. H. Allied to *D. Petraea.* It is a small shrub with narrow leaves about 1 in. long, in rosettes, and heads of rose-pink flowers. A much smaller plant is in cultivation under the same name. Transylvania. (G. Reuthe.)

Delphinium venustum. (*G. C.* 1915, lvii. 333.) Ranunculaceae. H. An early-flowering plant producing an abundance of gentian-blue flowers in somewhat lax inflorescences about 2¼ ft. high. Country not stated. (Miss Willmott.)

***Delphinium yunnanense.** (*N. B. G. Edinb.* vii. 182, 187; *Bees, Cat.* No. 48, 1914–15, 8, f.) H. Resembles *D. grandiflora*, but it has a more graceful habit. It grows from 9 in. to 2½ ft. high. Leaves finely cut, mottled with white. Flowers brilliant gentian-blue or sometimes light blue. Yunnan, China. (Bees, Ltd.)

Dendrobium falcorostrum. (*Orchis*, 1915, 89, f. 14.) Orchidaceae. S. Pseudobulbs spindle-shaped, up to 10 in. long, 2–4-leaved towards the apex. Leaves leathery, stiff, oblong, mostly about 4 in. long and 1¾–2 in. broad. Racemes rather densely 12–20-flowered, arising at or near the apex of the pseudobulbs. Flowers similar in shape and size to those of *D. speciosum*, white or yellowish, finely marked with red on the lip. New South Wales. (Palmengarten Gesellsch. zu Leipzig-Lindenau.)

Dendrobium galactanthum. (*Orchis*, 1915, 93, t. 7, ff. 1–7.) S. Stems erect, cylindric, 6–10 in. high. Leaves unknown. Racemes produced towards the apex of the older stems, short, 1–3-flowered. Flowers glabrous, rather smaller than those of *D. cariniferum*, cream-white, with green tuberculate nerves and keels on the lip. Siam. (Baron von Fürstenberg, Hugenpoet, near Mintard-on-Ruhr, Germany.)

Dendrobium pedilochilum. (*Orchis*, 1915, 50, t. 4, ff. 7–13.) S. Very similar to *D. moschatum*, but it may be distinguished by its slender habit and erect racemes of smaller orange-yellow flowers, with 2 purple-brown spots at the base of its very flat shoe-shaped lip. Burma. (W. Hennis, Hildesheim, Germany.)

Dendrobium Straussianum. (*Orchis*, 1915, 92, t. 6, ff. 16–21.) S. A robust species with growths upwards of 3 ft. long. Stems strong, terete, simple, about ⅓ in. thick, leafy. Leaves sessile, oblong, about 4 in. long. Flowers geminate, shortly stalked, lasting only a day. Sepals and petals narrowly ligulate, about 7 lin. long. Lip semi-oblong-cuneate, 3-lobed above the middle, 4 lin. long. Bismarck Archipelago. (Berlin-Dahlem B. G.)

Dendrobium Thompsonii. (*O. R.* 1915, 123.) S. Garden hybrid between *D. nobile nobilius* and *D. Owenianum.* (W. Thompson.)

Dendrobium veratrifolium, var. dahlemense. (*Orchis*, 1915, 16.) S. Differs from the type chiefly in the somewhat smaller flowers with greenish-white sepals and petals and greenish lip, the latter with a fine dark violet nervation. (Berlin-Dahlem B. G.)

Dendrobium viridescens. (*G. C.* 1915, lviii. 270.) S. Garden hybrid between *D. Wiganianum* and *D. aureum album.* (Sir J. Colman, Bart.)

Deuterocohnia longipetala. (*R. H.* 1914–15, 533.) Bromeliaceae. S. Closely allied to *Dyckia.* Leaves in a rosette, 1 ft. long. Inflorescence more than 3 ft. long, producing a succession of yellow flowers of which the segments are bordered with greenish-blue. Syn. *Dyckia longipetala,* Baker. Brazil. (R. Roland-Gosselin, La Colline de la Paix, Alpes-Maritimes, France; Paris B. G.)

Deutzia longifolia purpurea. (*Lemoine, Cat.* 1915, *no.* 188, 7.) Saxifragaceae. H. Flowers in large erect corymbs, a pretty purplish-pink. (V. Lemoine & Son, Nancy.)

***Dianthus woodfordiensis.** (*G. C.* 1915, lvii. 333.) Caryophyllaceae. H. Garden hybrid between *D. alpinus* and *D. deltoides.* (Clarence Elliott.)

Disa Blackii. (*G. C.* 1915, lvii. 287; *O. R.* 1915, 185.) Orchidaceae. G. Garden hybrid between *D. Luna* and *D. grandiflora.* (Flory & Black.)

Disa grandiflora aurea. (*O. R.* 1915, 251.) G. Differs from the typical form in the ground colour of the dorsal sepal in which there is a decided suffusion of yellow. (O. O. Wrigley.)

Dorstenia yambuyaensis. (*B. M.* t. 8616.) Urticaceae. S. An erect herb 1–1½ ft. high, rather hispidly hairy. Leaves *alternate,* elliptic-lanceolate, 3–6 in. long, 1½–3 in. broad, irregularly toothed; petiole ¼–⅓ in. long. Peduncles axillary, solitary, 1–1¾ *in. long.* The very small flowers are in disc-like inflorescences ⅓–¾ in. across; these are surrounded by a green fringe of teeth and tail-like processes, some of which are over 4 in. long. Belgian Congo. (Laeken Col. Gard., Brussels; Kew.)

***Draba Sundermanni.** (*G. M.* 1915, 211.) Cruciferae. H. Plant only 1 or 2 in. high, forming close compact cushions resembling a mossy *Saxifraga.* Flowers small, *pure* white. Country not recorded. (S. Arnott.)

Echeveria glauca × metallica. (*G. C.* 1915, lvii. 105.) Crassulaceae. G. Garden hybrid. (Whitelegg & Page.) [*Cotyledon.*]

Epidendrum Beyrodtianum. (*Orchis,* 1915, 49, t. 4, ff. 14–21.) Orchidaceae. S. Pseudobulbs cylindric, somewhat compressed, 8–10 in. long, 2-leaved. Leaves erect-spreading, ligulate, 8–11 in. long, up to 1 in. broad in the middle. Raceme 3–4 in. long. Flowers *up to* 3¾ *in.* across, yellowish-white, with dark purple marks on the lip. Sepals and petals lanceolate. Lip with a short claw and a sub-hastate-ovate blade. Guatemala. (O. Beyrodt, Marienfelde, Berlin.)

Epidendrum fragracarpum. (*G. C.* 1915, lviii. 12; *O. W.* v. 258.) G. Garden hybrid between *E. fragrans* and *E. prismatocarpum.* (Sir J. Colman.)

Epidendrum Goebelii. (*Orchis,* 1915, 5, t. 1, ff. 8–13.) G. A new species belonging to the small group in which the inflorescence is lateral. Flowers similar to those of *E. patens,* olive-green suffused with brown, nearly 2 in. across. Sepals and petals narrowly *tongue-shaped,* acute. Brazil. (Munich B. G.)

Eria bambusifolia. (*O. R.* 1915, 45.) *Orchidaceae.* G. A very distinct species with large leaves resembling those of a bamboo and loose arching terminal racemes up to 10 in. long. Flowers *erect,* striped with red-purple lines on a pale ground. Sikkim. (H. J. Elwes.)

Eria obvia. (*N. B. G. Edinb.* viii. 335.) G. A new species allied to *E. bractescens,* differing in having narrow bracts about as long as the ovary, *much* narrower sepals and petals, and a lip only 1 lin. broad. It is a free-flowering plant with graceful racemes of white flowers *about 5 lin.* across, having a faint odour of cinnamon. Yunnan, China. (Edinburgh B. G.)

Erica cinerea atrorubens. (*G. C.* 1915, lviii. 26.) Ericaceae. H. Flowers bright violet-rose, paler on the lower half; they are richer in colour than in the variety *rosea,* and brighter than in the variety *atropurpurea.* (G. Reuthe.)

***Euonymus oxyphyllus.** (*B. M.* t. 8639.) Celastraceae. H. Very similar to *E. latifolius,* from which it may be distinguished by its unlobed fruit. Leaves ovate-oblong, acuminate, serrate, 1¾ 3 in. long, 1–1½ in. wide. Sepals and petals 5, the latter greenish-purple. Fruit depressed-globose, carmine. Seeds with a scarlet arillus. Japan and Corea. Arnold Arboretum; Kew, since 1895.)

***Centiana barbata,** f. **grandiflora.** (*B. M.* t. 8609.) Gentianaceae. H. Differs from the typical form chiefly in its larger corolla and longer and more acuminate sepals. The corolla is 2½–3 in. long, with a green tube and 4 spreading lobes 1½ in. long and 1 in. broad, green outside, blue inside. Siberia. (Edinburgh B. G.; Kew.)

***Centiana gracilipes.** (*B. M.* t. 8630.) H. Resembles *G. dahurica*, but easily distinguished by its longer pedicels. It is a perennial herb with barren rosettes of narrowly lanceolate leaves, and erect or ascending flowering stems bearing opposite linear-lanceolate leaves up to 2 in. long and 1¼–1½ in. broad. Flowers solitary in the axils of the uppermost leaves. Pedicels about 2 in. long. Corolla purplish-blue; tube 1½ in. long; lobes ovate-triangular, ¼ in. long. Western China. (H. J. Elwes.)

Cladiolus kubangensis. (*G. C.* 1915, lviii. 87, f. 29.) Iridaceae. G. Plant about 18 in. high, with grass-like leaves. Flowering-stems 1- or 2-flowered. Flowers delicate rose spotted with reddish-brown. Angola. (Kew.)

Cladiolus Melleri. (*B. M.* t. 8626.) G. An erect slender rather stiff herb. Leaves few, linear, acute, about 1 ft. long, more than ½ in. broad. Scape about 2 ft. long, slender, stiff. Flowers about 1¼ in. apart. Perianth red; tube ¾ in. long, narrowly funnel-shaped, slightly curved; limb oblique, longer than the tube; segments oblong-lanceolate, obtuse or subacute. Eastern Tropical Africa. (Kew.)

Congora Hennisiana. (*Orchis*, 1915, 51, t. 5, ff. 1–6.) Orchidaceae. S. A new species resembling *G. grossa* in habit. Pseudobulbs ovoid, angular, 1¼–2 in. long, apparently 2-leaved. Leaves erect-spreading, elliptic, about 10 in. long. Raceme pendulous, up to 24 in. long including the peduncle, loosely 7–12-flowered. Flowers similar in shape to those of *G. grossa*, brown-yellow with dark purple spots on the sepals and petals. Sepals and lip up to 1 in. long. Probably Colombia. (W. Hennis, Hildesheim, Germany.)

Crammangis fallax. (*Orchis*, 1915, 120, f. 19.) Orchidaceae. S. This is the plant described and figured in *Veitch, Man. Orch.* pt. ix. 29 as *G. Ellisii* (*Grammatophyllum Ellisii*, Lindl.), but it differs from Lindley's plant in having longer bracts and smaller petals. Sepals yellow, thickly and finely brown-dotted. Petals white and violet, with yellow-brown tips. Lip white, with red lines and yellowish tip. Madagascar. (Berlin-Dahlem B. G.)

Grammatophyllum Schmidtianum. (*Orchis*, 1914, 133; 1915, 108.) Orchidaceae. S. Closely allied to *G. elegans* and possibly a form of the same species, differing in the size and colour of the flowers and in the form of the lip. Marionne Islands. (W. Schmidt, Leipzig.)

Habenaria Havilandii. (*O. R.* 1915, 31.) Orchidaceae. S. Stems 2 ft. high. Leaves 12 in. long, 2½ in. broad. The inflorescence bears from 14 to 20 flowers which are green with a white lip. Syn. *H. Hewittii*, Ridl. Borneo. (Glasnevin B. G.)

Haemanthus albiflos, var. **Cavannae.** (*B. T. O.* 1915, 12.) Amaryllidaceae. G. Leaves appearing with the flowers, lanceolate, slightly acute, 15–16 in. long, 2–3 in. broad, ciliate, glabrous above, more or less hairy beneath especially towards the base. Scape 16 18 in. high, slightly hairy, almost glabrous in the upper part. Umbel only ¾–1¼ in. across; spathe almost entirely white. (R. Scuola di Pomologia, Florence.)

Houlletia Wallisii, var. **Hennisiana.** (*Orchis*, 1915, 132.) Orchidaceae. S. Distinguished from the type by having the side-lobes of the lip distinctly toothed and by the short angles of the epichile. In the former character it agrees with the variety *odontoptera*, but differs in the latter. Colombia. (W. Hennis, Hildesheim. Germany.)

Iris Belouini. (*R. H.* 1914–15, 547, f. 163; *G. C.* 1915, lviii. 333.) Irideae. H. A new species of the group *Pogoniris* and allied to *I. germanica*. Stem 3–4 ft. high, branching into several heads, each bearing 1–3 flowers. Leaves about 20 in. long, at first glaucous, then pale green, somewhat bluntly rounded at the apex, mucronate, withering away after the flowering season. Flowers violet or sometimes mauve, fragrant, with horizontally spreading falls. Spathes green even after the flowers have faded. Morocco. (Champ de Courses, Longchamp, Paris.)

***Iris Wattii.** (*G. C.* 1915, lvii. 95.) H. Very closely allied to *I. japonica*, but it has a different habit of growth, producing a stem in the year before that in which it flowers, and its

leaves are broader and thinner. Spathe-valves unequal, the outer often twice as long as the inner. Flowers mauve-white, with some mottlings of a deeper mauve. Manipur and South-Western China. (W. R. Dykes.)

Kraenzlinella rufescens. (*O. R.* 1915, 326.) Orchidaceae. S. Habit similar to that of a *Pleurothallis*. Leaves oblong, fleshy, about 4 in. long. Flowers nearly ¾ in. long, reddish-orange, with some dusky dots on the lateral sepals and some stripes of a similar colour on the dorsal one. The genus is allied to *Scaphosepalum* and includes *Pleurothallis platyrhachis*, Rolfe; *B. M.* t. 7129. Probably Peru. (F. Sander & Sons.)

Laelia ancibarina. (*G. C.* 1915, lvii. 144; *O. R.* 1915, 36.) Orchidaceae. G. Garden hybrid between *L. anceps* and *L. cinnabarina*. (Armstrong & Brown.)

Laelia Jongheanceps. (*G. C.* 1915, lviii. 393.) G. Garden hybrid between *L. Jongheana* and *L. anceps Dawsoni*. (Sir J. Colman, Bart.)

Laelia tendiana. (*O. W.* v. 132.) G. Garden hybrid between *L. tenebrosa* and *L. Diana*. (E. Clark.)

Laelia teneflava. (*O. W.* v. 204.) G. Garden hybrid between *L. tenebrosa* and *L. flava*. (Stuart Low & Co.)

Laelio-cattleya aurata. (*G. C.* 1915, lvii. 144; *O. W.* v. 132.) Orchidaceae. G. Garden hybrid between *L.-c. Lydia* and *L.-c. Golden Oriole*. (F. J. Hanbury.)

Laelio-cattleya belgica. (*G. C.* 1915, lvii. 39.) G. Garden hybrid between *L.-c. Henry Greenwood* and *L.-c. Aphrodite*. (F. Sander & Sons.)

Laelio-cattleya Evansiae. (*G. C.* 1915, lvii. 218; *O. R.* 1915, 127.) G. Garden hybrid between *Laelia purpurata* and *Cattleya amethystoglossa*. (W. Evans.)

Laelio-cattleya Eyeringiana. (*G. C.* 1915, lviii. 341.) G. Garden hybrid between *Cattleya Bowringiana* and *Laelia Eyermanniana*. (Sir J. Colman, Bart.)

Laelio-cattleya flammea. (*G. C.* 1915, lvii. 144; *O. W.* v. 162.) G. Garden hybrid between *L.-c. highburyensis* and *L.-c. Haroldiana*. (Flory & Black.)

Laelio-cattleya fulva. (*G. C.* 1915, lviii. 211.) G. Garden hybrid between *L.-c. Golden Oriole* and *Cattleya fulvescens*. (Lieut.-Col. Sir G. L. Holford.)

Laelio-cattleya Hoylei. (*O. R.* 1915, 224.) G. Garden hybrid between *L.-c. Martinetii* and *L.-c. Sunset*. (Alwyn Harrison.)

Laelio-cattleya Jonyra. (*O. W.* v. 132.) G. Garden hybrid between *Laelia Jongheana* and *Laelio-cattleya Myra*. (Armstrong & Brown.)

Laelio-cattleya marginata. (*G. C.* 1915, lviii. 270.) G. Garden hybrid between *L.-c. Colmaniana* and *Laelia pumila*. (Sir J. Colman, Bart.)

Laelio-cattleya purpurascens. (*G. C.* 1915, lvii. 39.) G. Garden hybrid between *L.-c. Purple Emperor* and *Cattleya Lord Rothschild*. (Armstrong & Brown.)

Laelio-cattleya Robertsoniae. (*G. C.* 1915, lvii. 144.) G. Garden hybrid between *Cattleya Maggie Raphael* and *L.-c. luminosa*. (F. Sander & Sons.)

Laelio-cattleya Rossettii. (*O. W.* vi. 44.) G. Garden hybrid between *L.-c Antigone* and *L.-c. bletchleyensis*. (Flory & Black.)

Laelio-cattleya xanthina. (*G. C.* 1915, lviii. 393.) G. Garden hybrid between *L.-c. Phryne* and *Laelia tenebrosa Walton Grange*. (Sir J. Colman, Bart.)

Lilium cernuum. (*G. C.* 1915, lviii. 302, ff. 106, 107.) Liliaceae. H. Closely allied to *L. tenuifolium*. It has a similar bulb, but the flowers are fragrant and are a clear rose colour with violet spots. Leaves narrowly linear, 3¼–7½ in. long. Raceme lax, 1-6-flowered. Flowers nodding; segments broadly lanceolate, 1½–2 in. long, ¾ in. broad, completely revolute from the time of expansion. Corea and Manchuria. (Regel & Kesselring, Petrograd; Amos Perry.)

Liparis bicuspidata. (*O. R.* 1915, 160.) Orchidaceae. S. Allied to *L. lacerata*, but differs in the lip, which has 2 narrow slightly diverging lobes from a rounded base. Pseudobulbs ovoid, light reddish, bearing a pair of oblong leaves. Raceme elongated, drooping, with numerous buff flowers, reddish on the lip. Borneo. (Hon. N. C. Rothschild.)

Listrostachys Brownii. (*O. R.* 1915, 320.) Orchidaceae. S. Belongs to

the *L. arcuata* group and is distinguished from its allies by its short rather numerous leaves, only about 2½ in. long, and dense racemes which are slightly longer than the leaves. Flowers white, very fragrant. Spur about ¾ in. long, very strongly curved. Uganda. (Glasnevin B. G.)

Lonicera Griffithii. (*G. C.* 1915, lvii. 301; *Sargent, T. & S.* i. 47, t. 24.) Caprifoliaceae. G. or H.H. A twining shrub most nearly related to *L. Periclymenum*, from which it differs in the connate bractlets and the shape of the leaves, which are oblong to orbicular and are 1¼–2 in. long. Flowers in terminal pedunculate heads. Corolla 2-lipped, about 1 in. long, white flushed with rose. Afghanistan and Chitral. (Lieut.-Col. F. G. L. Mainwaring.)

***Lotus campylocladus,** f. **villosior.** (*B. M.* t. 8603.) Leguminosae. G. A branched herb with a woody root. Leaves petiolate, 3-foliolate, silvery; leaflets cuneate, ⅛–½ in. long, ⅛–⅓ in. broad. Umbels rather long-stalked, 3–5 flowered. Corolla yellow with red streaks. It differs from the type in having spreading hairs on stems, leaves and calyces, and in the longer leaflets. Canary Islands. (Kew.)

Luisia tonkinensis. (*Orchis*, 1915, 8, t. 2, ff. 14–22.) Orchidaceae. S. Plant up to 12 in. high. Leaves terete, subulate, 4½–6 in. long. Raceme short, 3–4 flowered. Flowers medium-sized for the genus, incurved, similar to those of *L. zeylanica*, with yellow-green sepals and petals suffused with reddish, dark purple lip and white-green column. Tonquin. (H. Goldschmidt, Essen-on-Ruhr, Germany.)

Lycaste Arthuriana. (*G. C.* 1915, lviii. 130; *O. W.* v. 272.) Orchidaceae. G. Garden hybrid between *L. plana* and *L. Balliae*. (R. Ashworth.)

Lycaste Goldschmidtiana. (*Orchis*, 1915, 140, f. 21.) G. Garden hybrid between *L. cruenta* and *L. aromatica*. (H. Goldschmidt, Essen-on-Ruhr, Germany.)

Lycaste macrophylla leucoptera. (*G. C.* 1915, lvii. 48.) G. "A very pretty and distinct form." (F. Sander & Sons.)

Magnolia Dawsoniana. (*B. T. O.* 1915, 173; *Pl. Wils.* i. 397.) Magnoliaceae. H. Tree 26–40 ft. high. Leaves leathery, obovate or elliptic-obovate, obtuse or very shortly acuminate, 3–6 in. long, 2–3 in. broad, glabrous, shining above, pale green or glaucescent beneath; petiole slender, ¾–1¼ in. long. Flowers unknown. Fruit cylindric, about 4 in. long, 1¼–1½ in. thick. Western China. (Arnold Arboretum.)

Malus baccata, f. **Jackii.** (*Pl. Wils.* ii. 291.) Rosaceae. H. Differs from the type in its larger elliptic leaves up to 5 in. long and 2¾ in. broad, larger flowers, and deep red fruits about 5 lin. across. Corea. (Arnold Arboretum.)

Malus Sieboldii, var. **calocarpa.** (*Pl. Wils.* ii. 294.) H. Distinguished from the type by its arborescent habit, less deeply lobed crenate-serrulate leaves, larger flowers, and larger deep red fruits. Japan. (Arnold Arboretum.)

Malus theifera. (*Pl. Wils.* ii. 283.) H. A small tree with stiff spreading branches producing in spring light pink flowers. Calyx purple. Fruits light greenish-yellow with a slightly reddish cheek. It is closely allied to *M.* [*Pyrus*] *baccata*, differing in having thicker more closely and sharply serrate leaves, the colour of the flowers, and in having 3 or 4 instead of 5 styles. China and Assam. (Arnold Arboretum.)

Malus transitoria. (*Pl. Wils.* ii. 295.) H. Young shoots more or less tomentose. Leaves acutely 3-lobed, 1–1¼ in. long, ¾–1 in. broad; petiole 7–10 lin. long. Inflorescence more or less tomentose, 3–8-flowered; pedicels 7 lin. long. Receptacle and calyx tomentose, nearly of equal length. Petals broadly oblong, somewhat emarginate, narrowly clawed, 5 times longer than the calyx. *Pyrus transitoria*, Batalin in *Act. Hort. Petrop.* xiii. 95. Western China. (Arnold Arboretum.)

***Meconopsis aculeata,** var. **nana.** (*K. B.* 1915, 144.) Papaveraceae. H. A dwarf form, the erect simple stems being only 4–6 in. high, and it produces a tuft of fibrous roots instead of a thick rootstock as in the type. It was in cultivation in 1865, and was re-introduced in 1907. North-West Himalaya. (Kew.)

***Meconopsis decora.** (*K.B.* 1915, 143.) H. A distinct new species, the type of the group *Decorae*, characterised by having prickly pinnatifid radical leaves, the rest of the plant being destitute of prickles, a simple stem, incised-serrate cauline leaves, setose sepals, 4–6 white petals, a distinct style, and a densely

setose capsule gradually attenuated into the style. Eastern Himalaya. (Greenwich Park.)

***Meconopsis latifolia.** (*K. B.* 1915, 146.) H. This is the plant included in the list of 1908 under the name of *M. sinuata*, var. *latifolia*.

***Meconopsis Prattii.** (*B. M.* t. 8619; *K. B.* 1915, 148.) H. Closely allied to *M. sinuata* and *M. rudis*, differing from the latter in its more herbaceous foliage, shorter flowering pedicels, white instead of yellow stamens, and pale green stigma. Petals 6–8, bright blue, sometimes flushed with purple and occasionally pale purple throughout, 1 in. long, ⅔–¾ in. broad. It has been cultivated as *M. Wardii*. Western China. (Edinburgh B. G.)

Megaclinium kamerunense. (*B. M. H. N.* 1914. 349.) Orchidaceae. S. Without description. Congo. (Paris B. G.) [This is probably *Bulbophyllum kamerunense*, Schlechter, in *Engl. Jahrb.* xxxviii. 15, f. 6 B, C, a small epiphyte with 2-leaved pseudobulbs, oblong-ligulate leaves about 3½ in. long, a scape conspicuously longer than the leaves, bearing a falcate-subflexuose compressed much thickened rhachis with sessile flowers scarcely ¼ in. long.]

***Mesembryanthemum stylosum.** (*B. M.* t. 8595 B.) Ficoideae. G. Belongs to the same group as *M. thecatum*, but the leaves are much less united, forming an oblong corpusculum 1–2 in. long and ½–⅔ in. broad, deeply 2-lobed at the apex. Corolla gamopetalous, ¾–1½ in. across, yellow. The flowers last for 5 or 6 days. Little Namaqualand. (Kew.)

Mesembryanthemum Taylori. (*G. C.* 1915, lviii. 197.) G. A new species of dwarf habit, flowering freely all the summer. Plant 3–4 in. high, much branched. Leaves ascending or slightly spreading, 4–7½ lin. long, 2–2½ lin. thick, sharply 3-angled, light green, glabrous and smooth. Flowers solitary, terminal, sessile between 2 leaves, milk-white, about ¾ in. across. Petals about 40, linear, in 2 or 3 series. Stamens many, erect, orange. Stigmas 4. South Africa. (E. Taylor.)

***Mesembryanthemum thecatum.** (*B. M.* t. 8595 A.) G. A new species belonging to the group in which each branch of the plant consists of a pair of leaves which are partly or wholly united into one mass termed a corpusculum. The corpusculum in this species is obconic, about ⅓ in. thick, with a central chink ⅛ in. long. Corolla gamopetalous, ½–¾ in. across, rose-purple with a yellow eye. Each flower lasts from 4 to 6 days. Cape Colony. (Kew.)

***Metrosideros diffusa.** (*B. M.* t. 8628.) Myrtaceae. G. or H.H. A climbing shrub with spreading branches. Leaves shortly petiolate, oblong or elliptic-oblong, ½–¾ in. long, ⅓–⅔ in. broad, very leathery. Flowers numerous, cymosely arranged at the ends of the branches. Petals orbicular, small, pink. Stamens numerous, with long pink filaments and yellow anthers. New Zealand. (T. A. Dorrien Smith.)

Miltonia Hyeae. (*O. W.* v. 145.) Orchidaceae. S. Garden hybrid between *M. Hyeana* and *M. Phalaenopsis*. (J. Hye de Crom, Ghent.)

Miltonia vexillaria Leeana. (*G. C.* 1915, lviii. 125.) S. A very fine variety, some of the flowers being 5¾ in. long and 4½ in. across. (W. R. Lee.)

***Morina Beesiana.** (*Bees, Cat.* No. 48, 1914–15, 9.) Dipsaceae. H. Stems 9 in. high, leafy, arising from a tuft of prickly serrate leaves. Flowers in a terminal head, white, fragrant. Western China. (Bees, Ltd.)

Narcissus cyclathinus. (*G. C.* 1915, lvii. 202.) Amaryllidaceae. H. Garden hybrid between *N. cyclamineus* and *N. calathinus*. (H. Chapman.)

***Nephelaphyllum pulchrum, var. sikkimense.** (*O. R.* 1915, 223.) Orchidaceae. S. Somewhat stouter in habit than the type. Leaves variegated. Flowers in a short erect spike. Sikkim. (Kew.)

Odontioda Armstrongiae. (*G. C.* 1915, lviii. 370.) Orchidaceae. G. Garden hybrid between *O. Bradshawiae* and *Odontoglossum Armstrongiae*. (Armstrong & Brown.)

Odontioda Colmaniae. (*G. C.* 1915, lvii. 287; *O. R.* 1915, 185.) G. Garden hybrid between *O. Bradshawiae* and a hybrid *Odontoglossum* of which the name is not recorded. (Sir J. Colman, Bart.)

Odontioda Henryi. (*O. R.* 1915, 37.) G. Garden hybrid between *Cochlioda Noetzliana* and *Odontoglossum harvengtense*. (Armstrong & Brown.)

Odontioda laevetzliana. (*G. C.* 1915, lviii. 194; *O. W.* v. 276.) G. Garden

hybrid between *Odontoglossum laeve* and *Cochlioda Noetzliana*. (De B. Crawshay.)

Odontioda leopardina. (*G. C.* 1915, lviii. 299.) G. Garden hybrid between *O. beechense* and *Odontoglossum Vuylstekeii*. (R. Ashworth.)

Odontioda loochristiensis. (*O. R.* 1915, 148.) G. Garden hybrid between *Cochlioda Noetzliana* and *Odontoglossum gloriosum*. (Hassall & Co.)

Odontioda luminosa. (*G. C.* 1915, lvii. 306; *O. R.* 1915, 157.) G. Garden hybrid between *Odontoglossum Rossii rubescens* and *Odontioda Charlesworthii*. (R. Ashworth.)

Odontioda rotunda. (*G. C.* 1915, lvii. 306.) G. Garden hybrid beween *Cochlioda Noetzliana* and *Odontoglossum excellens*. (Armstrong & Brown.)

Odontioda vivicans. (*G. C.* 1915, lvii. 306.) G. Garden hybrid between *O. Vuylstekeae* and *Odontoglossum Sanderae*. (F. Sander & Sons.)

Odontochilus lanceolatus. (*O. R.* 1915. 318.) Orchidaceae. G. A pretty little plant with green leaves and an erect spike of flowers about 6 in. high. Sepals and petals light green. Lip bright yellow, with 2 obliquely-spreading front lobes and a strongly-toothed claw. Anther pink. Syn. *Anoectochilus lanceolatus*, Lindl. Sikkim and Khasia Hills. (H. J. Elwes.)

Odontoglossum cerissimum. (*G. C.* 1915, lviii. 92; *O. W.* v. 272.) Orchidaceae. G. Garden hybrid between *O. Ceres* and *O. ardentissimum*. (Flory & Black.)

Odontoglossum crispo-Wiganianum. (*G. C.* 1915, lvii. 144.) G. Garden hybrid. (Pantia Ralli.)

Odontoglossum Edwardimium. (*G. C.* 1915, lvii. 144; *O. W.* v. 126, 163.) G. Garden hybrid between *O. Edwardii* and *O. eximium*. (Armstrong & Brown.)

Odontoglossum Farnesii. (*G. C.* 1915, lvii. 218; *O. W.* v. 163.) G. Garden hybrid between *O. Crawshayanum* and *O. Rolfeae*. (Pantia Ralli.)

Odontoglossum Hunnewellianum citrinum. (*O. R.* 1915, 134; *O. W.* v. 172.) G. Flowers a clear light citron-yellow, quite destitute of the characteristic brown markings. (F. J. Hanbury.)

Odontoglossum maculum. (*G. C.* 1915, lvii. 159; *O. W.* v. 162.) G. Garden hybrid between *O. maculatum* and *O. aspersum*. (W. Thompson.)

Odontoglossum Phillipsianum. (*G. C.* 1915, lvii. 218.) G. Garden hybrid between *O. luteopurpureum Vuylstekeanum* and *O. eximium*. (C. J. Phillips.)

Odontoglossum primulinum. (*G. C.* 1915, lvii. 144; *O. W.* v. 131.) G. Garden hybrid between *O. Wilckeanum* and *O. excellens*. (F. J. Hanbury.)

Odontoglossum wylamense. (*G. C.* 1915, lviii. 130.) G. Garden hybrid between *O. percultum* and *O. Harryanum*. (Mrs. N. C. Cookson.)

Oncidioda waltonensis. (*G. C.* 1915, lvii. 141; *O. R.* 1915, 157.) Orchidaceae. G. Garden hybrid between *Cochlioda vulcanica* and *Oncidium incurvum*. (W. Thompson.)

Oncidium Blossfeldianum. (*Orchis*, 1915, 56.) Orchidaceae. G. Allied to *O. micropogon*, but differing in the 5-lobed callus and very small broadly elliptic front lobes of the lip. Flowers yellow, densely spotted with pale olive-brown on the sepals and petals, and spotted with brown on the front part of the lip. Brazil. (R. Blossfeld, Potsdam, Berlin.)

Orchis hybrida. (*O. R.* 1915, 195.) Orchidaceae. H. A natural hybrid between *O. purpurea* (*fusca*) and *O. militaris*. It has been found in several localities in France, Switzerland and Germany, and has been known to botanists since about 1786. (G. Reuthe.)

***Ornithoboea Lacei.** (*B. M.* t. 8627.) Gesneraceae. S. Herb, apparently biennial. Stem in the lower portion, produced the first season, over 4 in. long; upper flowering portion usually about 12 in. long, glandular-hairy. Leaves usually unequal-sided, generally broadly ovate, crenate-serrate, 1½–4 in. long, 1–3¼ in. broad, rather hairy; petiole up to 4½ in. long. Cymes axillary, several-flowered. Corolla 2-lipped, white with purplish blotches; tube under ⅓ in. long; upper lip very shortly 2-lobed; lower lip as long as the tube, 3-lobed. Burma. (Kew.)

***Ornithoboea lanata.** (*K. B.* 1914, 130; *B. M.* sub t. 8627.) Distin-

guished from all the other known species by the cinnamon-coloured wool clothing stem, petioles and peduncles. Stem 8–12 in. high. Leaves unequal-sided, ovate or elliptic-ovate, up to 11 in. long and 5 in. broad; petiole up to 2¼ in. long. Inflorescence axillary. Corolla not described. Siam. (Trinity Coll. B. G., Dublin; Kew.)

***Paeonia obovata.** (*G. C.* 1915, lvii. 290, f. 94.) Ranunculaceae. H. Plant reaching a height of about 2 ft., with foliage characteristic of the genus, and white flowers 4–5 in. across. A re-introduction. Manchuria and China. (J. C. Allgrove.)

Phaius villosus, var. **longibracteatus.** (*B. M. H. N.* 1914, 356.) Orchidaceae. S. Remarkable for its long bracts, which are about 3⅓ in. long. Flowers green, especially at the apex, pale greenish-yellow at the base; lip spurless, acuminate, bearing broad clear maroon blotches inside and 4 crests of golden-yellow hairs. Mascarene Islands. (Paris B. G.)

Phalaenopsis sumatrana alba. (*O. W.* v. 146.) Orchidaceae. S. Flowers pure white with 3 delicate reddish stripes on both sides of the lip and a trace of light yellow on the side lobes. (L. Schmid, Sourabaya, Java.)

Piptanthus tomentosus. (*N. B. G. Edinb.* vii. 16, 97; *Bees, Cat.* No. 48. 1914–15, 9.) Leguminosae. H. Shrub 3–5 ft. high. Leaves and young stems covered with white silky hairs. Flowers golden-yellow, borne in erect racemes. It is described as being better in every way than *P. nepalensis*. Western China. (Bees, Ltd.)

Pleione diantha. (*Orchis*, 1915, 44, f. 7.) Orchidaceae. G. Nearly allied to *P. humilis*, but it has longer and apparently always 2-flowered scapes and the lip of the flower is more deeply ciliate on the margin and has 6 instead of 5 rows of cilia on the front. Sepals and petals 1¼ in. long, white. Lip about as long as the sepals and petals, white, with numerous red spots. Burma. (W. Hennis, Hildesheim, Germany.)

Pleurothallis lilacina. (*O. R.* 1915, 223.) Orchidaceae. G. Plant only a few inches high, with broad fleshy leaves and a profusion of short spikes of lilac-purple flowers. Brazil. (Kew.)

Pleurothallis Purpusii. (*Orchis*, 1915, 49, t. 4, ff. 1–6.) G. Plant tufted, about 4 in. high. Stems flexuose, 1-leaved. Leaves lanceolate, subacute, 1¾–2 in. long, 3½–4½ lin. broad. Raceme 4–6-flowered. Flowers only about 1 lin. long, whitish, with the lip and tips of the sepals dark purple. Mexico. (Darmstadt B. G.)

Pleurothallis rhynchoglossa. (*Orchis*, 1915, 91, t. 6, ff. 8–15.) G. Plant 3–6 in. high, tufted. Stems slender, terete, rigid, 1-leaved. Leaves sessile, lanceolate-elliptic, 2–3 in. long. Spikes up to 10 lin. long, loosely 2–3-flowered. Flowers scarcely moderately large for the genus, yellowish, suffused and striped with purple, with a red-yellow border to the lip and a yellow column. Mexico. (Darmstadt B. G.)

Polypodium Dryopteris plumosum. (*G. C.* 1915, lviii. 187, f. 63.) Filices. H. Fronds broader than in the type, pale soft green. The pinnules are also broader and have a tendency to overlap, giving the frond a plumose appearance. Westmorland. (T. G. H. Eley.)

Polystachya Hamiltonii. (*N. B. G. Edinb.* viii. 347.) Orchidaceae. S. A new species allied to *P. Kirkii* and *P. affinis*, but it has long leaves, a racemose inflorescence, flowers about 4 lin. long, a 3-lobed slightly recurved lip 3½ lin. long, and other differences in the structure of the greenish-yellow flowers. Nigeria. (Edinburgh B. G.)

***Posoqueria densiflora.** (*G. C.* 1915, lvii. 306, ff. 100–101.) Rubiaceae. S. A new name for the plant originally described as *Martha fragrans*, Fritz Müller (*Posoqueria fragrans*, Darwin), and which is in cultivation as *P. longiflora* (not the true *P. longiflora*, Aubl.). Its flowers are more densely arranged on the short axis bearing them than in any other species. Corolla white; tube very slender, about 7 in. long. Brazil. (Kew.)

***Potentilla eriocarpa.** (*N. B. G. Edinb.* vii. 157; *Bees, Cat.* No. 48, 1914-15, 9.) Rosaceae. H. A shrubby plant 4–8 in. high, nearly glabrous. Leaves of 3 cuneate incised leaflets. Flowers solitary, soft yellow with a large orange blotch on each petal. A re-introduction. Himalaya and Western China. (Bees, Ltd.)

Potentilla fruticosa, var. **albicans.** (*Pl. Wils.* ii. 302.) H. Leaves loosely adpressed-villose above, silky-tomentose and whitish beneath. Outer sepals elliptic, mucronate, about as long as the inner. Otherwise similar to the common form. Western

China. (Highland Park, Rochester, N.Y., U.S.A.)

***Poterium obtusatum.** (*G. C.* 1913, liv. 108; 1915, lviii. 123.) Rosaceae. H. Leaves compound, resembling those of *Sanguisorba officinalis*. Flowering-stem about 2 ft. high, bearing nodding tail-like spikes about 3 in. long. These are crowded with small flowers having conspicuous bright rose-coloured stamens. Japan. (Barr & Sons.) [*Sanguisorba obtusa*, Maxim., var. *amoena*, Jesson.]

Primula brevifolia. (*G. C.* 1915, lvii. 207, f. 63.) Primulaceae. H. A pretty species belonging to the section *Amethystina* and resembling a *Soldanella*. Leaves in a rosette, bright green, oblong. Scape purplish, bearing an umbel of about 6 drooping flowers. Calyx purple-black. Corolla bell-shaped, fringed, blue-purple. Yunnan, China. (Edinburgh B. G.)

Primula florida. (*G. C.* 1915, lvii. 207, f. 65.) H. Closely allied to *P. incisa*. Leaves in a rosette, long-stalked; blade ovate, covered beneath with white meal. Scape slender, much longer than the leaves. Flowers shortly stalked, in a umbel. Calyx mealy. Corolla purple-blue, rapidly fading to a paler tint. Yunnan, China. (Edinburgh B. G.)

Primula gracilenta. (*G. C.* 1915, lvii. 207, f. 64.) H. Belongs to the *Muscarioid* section. Leaves in a rosette, stalked, oblong, wavy, hairy. Scape hairy, bearing a spicate inflorescence. Flowers deflexed, deep lilac. Lobes of the corolla shortly tailed, giving the corolla a fringed appearance. Yunnan, China. (Edinburgh B. G.)

***Primula minor.** (*N. B. G. Edinb.* ix. 29; *G. C.* 1915, lvii. 282.) H. A small pretty species allied to *P. pulchella*. It is a hairless plant with petiolate oblong-spathulate leaves up to 2 in. long and ⅓ in. broad, farinose above, and a peduncle 4 in. long, bearing a large head of soft lilac or lavender white-eyed flowers. Corolla-tube 6–7½ lin. long; lobes spreading, narrowly obovate or elliptic, up to 5 lin. long, obscurely crenate. Yunnan, China. (Bees, Ltd.; Edinburgh B. G.)

***Primula Miyabeana.** (*B. M.* t. 8606.) H.? Allied to *P. Poissoni*, but distinguished from it and from all the other known species of the section *Candelabra* by having the calyx farinose inside. Leaves oblong-obovate or broadly oblanceolate, up to 8 in. long, 1¼–2 in. broad. Scape single, up to 2 ft. high, bearing several 6–10-flowered superposed whorls. Corolla purple; tube over ½ in. long; lobes obcordate, nearly ¼ in. long. Formosa. (Kew.)

***Primula nutans.** (*G. C.* 1915, lviii. 26.) H. A very pretty species belonging to the section *Soldanelloides*. The scapes are 18 in. high, bearing an oblong spike of large pendulous salver-shaped pale lavender flowers, which are sprinkled with a white meal on calyx and corolla. Western China. (R. Wallace & Co.)

***Primula Reinii.** (*G. C.* 1915, lvii. 214, 240, f. 66; *J. R. H. S.* xxxix. 177, f. 84; *N. B. G. Edinb.* viii. 87, t. 17 B.) H. Plant 4–5 in. high, deciduous when at rest. Leaves petiolate, almost circular, deeply cordate and lobed, densely clothed with long soft hairs when young. Umbels 2–6-flowered, raised well above the leaves. Flowers showy, 1½ in. across, lilac or deep rose with a yellow eye. Corolla-lobes deeply notched. Mountains of Central Japan. (Introduced a few years ago by the Yokohama Nursery Company.)

Primula rufa. (*Bees, Cat.* No. 48, 1914–15, 11.) H. Allied to *P. Forrestii*, but its flowers, which have the same perfume, are larger; they are yellow and are borne in slightly drooping umbels raised well above the leaves. Calyces and backs of the corollas covered with a fine cream-coloured powder. Western China. (Bees, Ltd.)

***Primula silvicola.** (*G. C.* 1915, lvii. 129.) H. Allied to *P. mollis*. Leaves petiolate, large, rounded, dark green, crenate, hairy, much veined. Inflorescences several to each plant, each consisting of many tiers of somewhat irregular flowers, resembling a dark form of *P. malacoides*. Pedicels 1 in. long, subtended by linear bracts about ⅓ in. long. Calyx shortly campanulate; lobes linear, with scariose edges. Western China. (R. Wallace & Co.)

Primula tosaensis. (*Gard.* 1915, 266. f.) H. Allied to *P. Reinii*. It is a very hairy plant with petiolate ovate coarsely toothed leaves and a few rather large drooping flowers borne in an umbel. Corolla star-shaped, with deeply notched lobes, magenta-pink. Japan. (J. Macwatt.)

***Primula Wardii.** (*N. B. G. Edinb.* ix. 58.) H. This was included in the list of 1909 as *P. sibirica chinensis*. It has fragrant greenish-yellow flowers with a blue eye, and is easily

distinguished from the true *P. sibirica* by the long appendages to the bracts. Central and Western China. (J. Veitch & Sons.)

Primula Woodwardii. (*N. B. G. Edinb.* ix. 61.) H. A new species of the section *Nivalis* and allied to *P. purpurea*, but it is not farinose and is glandular-puberulous. Leaves rather thick, slightly more than 3 in. long, up to ⅔ in. broad. Scape robust, up to 8 in. high. Umbel up to 10-flowered. Corolla-tube up to 7 lin. long; lobes oblong-obovate, entire, up to 5 lin. long and 4 lin. broad, deep blue-purple. Kansu, China. (R. W. Woodward, Jun.; Edinburgh B. G.)

***Prinsepia uniflora.** (*Pl. Wils.* ii. 345.) Rosaceae. H. Distinguished from *P. sinensis* by the rather papery sometimes serrulate much narrower leaves, and by the short-stalked white flowers, which are about ⅔ in. across and are borne 1–3 together on the previous year's branches. Leaves up to 2½ in. long and ⅓ in. broad. Northern Shensi, China. (Arnold Arboretum.)

Pyronia Veitchii. (*B. T. O.* 1915, 174.) Rosaceae. H. Hybrid between a pear and a quince. (Algiers B. G.)

***Pyrus yunnanensis.** (*B. M.* t. 8629.) Rosaceae. H. This is the correct name of the plant included in the list of 1912 as *P. Veitchiana*.

***Raoulia australis.** (*G. C.* 1915, lviii. 339, 369.) Compositae. H. A perennial herb 1–6 in. high, forming broad flat patches. Leaves imbricated, linear or obovate-spathulate to rounded-spathulate, ⅛ in. long or less, silvery, glistening. Flower-heads ⅛–¼ in. long: Involucral bracts in 2 or 3 series, the inner shining pale yellow. Florets 12–20 or more. Pappus of very numerous extremely slender hairs. See *Cheeseman, Man. New Zealand Fl.* 329. New Zealand. (H. Evans; S. Arnott.)

Rhododendron carneum. (*B. M.* t. 8634.) Ericaceae. G. A distinct species allied to *R. Veitchianum*, but the calyx-lobes are much smaller and long-ciliate, the corolla is smaller, flesh-coloured and unspotted inside, while its almost flat lobes are spreading and not crisped on the margin. Leaves elliptic-obovate, subacute, 2¼–4½ in. long, 1¼–1½ in. broad, deep green above, glaucous and covered with yellow glands beneath. Corolla-tube 1⅓–1½ in. long, 1¼ in. across at the mouth; lobes oblong, 1¼ in. long, 1–1⅓ in. broad. Upper Burma. (Col. F. B. Longe.)

***Rhododendron oleifolium.** (*Gard.* 1915, 217, as *R. olicifolium.*) H. A dwarf compact species somewhat resembling *R. racemosum*, but its flowers are larger and more bell-shaped, and of a deeper rosy pink. Western China. (R. Hort. Soc.)

Rhododendron stamineum. (*B. M.* t. 8601.) H. Belongs to the section *Choniastrum*, in which the flowers are produced from axillary buds crowded at the ends of the branches; associated with this character are eglandular persistent leaves and long tubular funnel-shaped corollas. Leaves in *R. stamineum* ovate-lanceolate, 2–4 in. long, ¾–1¼ in. broad. Flowers fragrant. Corolla white with the upper lip yellow at the base. Filaments very much exserted. Western China. (J. C. Williams.)

Ribes Maximowiczii, var. **floribundum.** (*K. B.* 1915, 347.) Saxifragaceae. H. A branched dioecious shrub about 6 ft. high, unarmed. Leaves variously shaped, from ovate to 3- or 5-lobed, sometimes entire, 2½–4 in. long and broad, pubescent; petiole ¾–1½ in. long. Racemes solitary, more or less erect or somewhat pendulous at the apex, 5–6 in. long. Calyx broadly cup-shaped, dark red. Petals minute. Fruit globose, about 5 lin. across, clothed with a few short bristles mixed with slender hairs. Western China. (Col. S. R. Clarke.)

***Roettlera Forrestii.** (*N. B. G. Edinb.* v. 224; *G. C.* 1915. lviii. 265, 278, f. 97, as *Rottlera Forrestii.*) Gesneraceae. H.H. Leaves in rosettes 5 in. across, very much like those of a *Ramondia*, the outer shortly stalked, the inner sessile, coarsely toothed, covered with grey hairs. Scapes up to 6 in. high, bearing 4 to 7 pale yellow cylindrical flowers scarcely ½ in. long. South-Western China. (Kew.)

Rosa bella. (*Pl. Wils.* ii. 341.) Rosaceae. H. A pretty species most closely related to *R. Moyesii*, but it is a less vigorous plant with few slender prickles or sometimes almost unarmed, smaller usually less acute leaflets, glabrous above and glaucescent beneath, and smaller flowers with ovate-lanceolate entire sepals. The flowers are rose-coloured, 1¾–2 in. across, fragrant, and are solitary or 2 or 3 together at the ends of short terminal branchlets. Shansi, China. (Arnold Arboretum.)

Rosa bella, f. **pallens.** (*Pl. Wils.* ii. 342.) H. Differs from the type in the pale colour of the flowers. Shansi, China. (Arnold Arboretum.)

Rosa cerasocarpa. See **R. Centiliana.**

***Rosa floribunda.** See **R. Helenae** and **R. Centiliana.**

***Rosa Centiliana.** (*Pl. Wils.* ii. 312.) H. A tall more or less climbing shrub. Branches sparingly armed with strong recurved prickles. Leaves 5–7 in. long, 5- or rarely 3-foliolate; leaflets ovate or elliptic-ovate, acuminate, sharply serrate; stipules adnate, very narrow, free at the apex. Inflorescence a terminal corymbiform many-flowered cyme 3–7 in. across. Pedicels ¾–1¾ in. long, densely glandular. Flowers white, 1–1¼ in. across. Fruits globose, dark red, about 5 lin. long; calyx-lobes and style deciduous. Syns. *R. cerasocarpa*, Rolfe in *K. B.* 1915, 89; *R. moschata maculata*, Hort. It is figured in *G. C.* 1915, lvii. 210, f. 70, as *R. floribunda*. The description on the same page is of *R. Helenae*. Central China. (Sir W. T. Thiselton-Dyer; Paul & Son.)

***Rosa Helenae.** (*Pl. Wils.* ii. 310.) H. Allied to *R. Brunonii* and *R. moschata*. It forms a dense bush often 20 ft. high. Stems with strong recurved prickles. Leaflets 3-9, usually 7–9, oblong-ovate or ovate-lanceolate, serrate, glabrous. Peduncles very glandular. Flowers pure white, about 1 in. across, in large clusters. Fruits orange-red, ovoid to ellipsoid, sometimes more than 7 lin. long. Syn. *R. floribunda*, Rolfe in *G.C.* 1915, lviii. 210, excluding figure. Central China (Arnold Arboretum; Paul & Son.)

***Rosa longicuspis.** (*Pl. Wils.* ii. 313.) H. A distinct species related to *R. Brunonii*, but easily distinguished from it by its glabrous reddish-brown shoots, more coriaceous shining green leaves, the hairy back of the petals, and by its much larger fruit. Flowers white. It is in cultivation under the name of *R. lucens*. China and Northern India. (Paul & Son.)

***Rosa Pokornyana.** (*G. C.* 1915, lviii. 2.) H. A natural hybrid between *R. rubrifolia* and *R. canina*. Syn. *R. scopulosa*, Briq. (Kew.)

***Rosa Rubus.** (*Pl. Wils.* ii. 308, 311.) H. A climbing bush 10–20 ft. high with densely hairy shoots and leaves; leaflets 5, often large and coarsely toothed, variable in shape, giving the leaves a resemblance to those of certain species of *Rubus*. Flowers of moderate size, white, fragrant. Fruits globose, red or scarlet. Central and Western China. (Arnold Aboretum: Kew.)

***Rosa rugosa × macrophylla.** (*Gard.* 1915, 507.) H. Garden hybrid. (Kew.)

***Rosa xanthina.** (*Pl. Wils*, ii. 342.) H. This is believed to be the true plant described by Lindley. It has yellow double flowers and is closely related to *R. Hugonis*, from which it may be distinguished by the flattened-subulate straight prickles, very slightly dilated at the base and very woolly, by the absence of bristles, the more prominent stipules, and the large flowers. *R. xanthina* previously in cultivation and figured in *B. M.* t. 7666 is referred to *R. Ecae*, Aitchison. Shantung, China. (Arnold Arboretum.)

***Sansevieria angustiflora.** (*K. B.* 1915. 248.) Liliaceae. S. Closely allied to *S. thyrsiflora*, from which it differs by the more numerous leaves (usually varying from 5–12) to a growth, by their more elongated-lanceolate form, by their brighter and more pronounced variegation and narrower reddish margin. Natal or Zululand. (Kew.)

***Sansevieria burmanica.** (*K. B.* 1915, 228, f. 12.) S. Closely allied to *S. Roxburghiana*, under which name it is figured in *B. M.* t. 7487, and to *S. zeylanica*. From the former it is distinguished by its much more erect and very straight leaves, and from the latter by its much thinner and more flexible leaves, with more numerous lines on the back and by the lighter green colour. Upper Burma. (Kew.)

***Sansevieria caulescens.** (*K. B.* 1915, 200, f. 2.) S. Resembles *S. Powellii*, but the channel down the face of the leaf is always much narrower, except at the base, than the leaf itself, and the whitish flowers are in a spike-like inflorescence. British East Africa. (Kew.)

***Sansevieria chinensis.** (*K. B.* 1915. 242, f. 18.) S. Stemless. Leaves 3 6 to a growth, erect or ascending-spreading, 1½ 2¼ ft. long. 1¼-4 in. broad, varying from nearly strap-shaped to lanceolate, acute, with transverse dark green and lighter green bands on both sides; petiole concave-channelled. 2–7 in. long. Flower-stem 2–2¾ ft. high, bearing a rather compact raceme 1–1¼ ft. long. Flowers 2–3 in a cluster, pale greenish-white. Native country unknown. In cultivation for several years. (Brussels B. G.)

***Sansevieria cylindrica,** var. **patula.** (*K. B.* 1915, 218, f. 5 D.) S. Dis-

tinguished from the type by the leaves being distinctly spreading from a curvature near the base, not straight and stiffly erect. It is in cultivation under the names of *S. cylindrica* and *S. angolensis*. Angola. (Kew.)

***Sansevieria Dawei.** (*K. B.* 1915, 247, with 2 tt.) S. Stemless. Leaves of adult plants 2–3 to a growth, ascending or suberect, 2–5 ft. long, 2¼–4½ in. broad, elongate-lanceolate, tapering from above the middle upwards to an acute apex and downwards into a short or long concave-channelled petiole. Flower-stem 1½–2½ ft. high, bearing a rather compact spike-like raceme of flower-clusters. Flowers 3–4 in a cluster, white; tube ¾–1 in. long; lobes ⅔–⅞ in. long. Uganda. (Kew.)

***Sansevieria Dooneri.** (*K. B.* 1915, 231, f. 13 A-B.) S. Very similar to *S. parva*, from which it differs in its less evident stem and less erect habit, the leaves being much more recurved. It differs also in colour, the leaves being of a much darker and duller green, with very inconspicuous markings. British East Africa. (Kew.)

***Sansevieria gracilis.** (*K. B.* 1915, 204, f. 4.) S. Stem 1–3 in. high with procumbent and slightly ascending-spreading branches ½–3 ft. long. Leaves 8–12 to a growth, ascending or spreading, the fully developed ones ¾–2½ ft. long, sheathing, concave-channelled for 2–5 in. at the base, cylindric above, at first without grooves or channels, becoming faintly to deeply grooved on the oldest leaves, spine-like at the apex. Flower-stem ½–1 ft. high, bearing a lax spike-like raceme 2½–3 in. long. Flowers in pairs, white. British East Africa. (Kew.)

***Sansevieria grandis,** var. **zuluensis.** (*K. B.* 1915, 252, f. 21.) S. Leaves 2½–4 in. broad. Pedicels 2–3 in. long, jointed at or slightly above the middle, with a distinct deciduous part. Perianth-tube 10–14 lin. long; lobes 10–11 lin. long. Otherwise as in the type. Zululand. (Kew.)

***Sansevieria Kirkii,** var. **pulchra.** (*K. B.* 1915, 256.) S. Leaves, especially the younger, handsomely and conspicuously marked with whitish-green or somewhat buff-coloured or sometimes almost reddish spots or bands on both sides, and with a white membranous edge to the red-brown margin. This has been confused with *S. longiflora*, Sims. Zanzibar. (Kew; Paris B. G.)

***Sansevieria metallica,** var. **longituba.** (*K. B.* 1915, 247.) S. Differs from the type in having a brownish-green or dull purplish flower-stem, thickly speckled with pale green. Pedicels 2–3½ lin. long, jointed close under the flower. Perianth-tube 14 lin. long; lobes 14 lin. long. Tropical Africa. (Paris B. G.; Kew.)

***Sansevieria metallica,** var. **nyasica.** (*K. B.* 1915, 247, f. 20.) S. Pedicels 2–3 lin. long, jointed at or a little above the middle. Perianth-tube 7–8 lin. long, greenish-white or tinged with red; lobes 9 lin. long, white. Otherwise as in the type. Nyasaland. (Kew.)

***Sansevieria nilotica,** var. **obscura.** (*K. B.* 1915, 238.) S. Leaves 4–5 to a growth, erect, 2–2¾ ft. long, 1½–2¾ in. broad, very narrowly lanceolate or strap-shaped, tapering near the apex into a soft subulate point and below into a deeply concave-channelled petiole ½–1¼ in. long. Flower-stem 2–3 ft. long, bearing a raceme of flower-clusters. Flowers 3–6 in a cluster, whitish or greenish-white with purplish lines. Uganda. (Kew.)

***Sansevieria parva.** (*K. B.* 1915, 233, f. 13 C-F.) S. Stem usually evident and often rising 1–5 in. above the ground. Leaves 6–14 to a growth, the inner ascending or suberect and slightly recurved-spreading in the upper part, 8–18 in. long, 4–7 lin. broad, the outer gradually shorter, more spreading and up to 14 lin. broad, all linear to lanceolate, concave or deeply channelled down the face or folded longitudinally, rounded or obtusely keeled on the back, the younger with distinct bands of different shades of green on both sides. Flower-stem about 1 ft. high, bearing a lax raceme of flower-clusters. Flowers pinkish-white and mauve or purplish. British East Africa. (Kew.)

***Sansevieria patens.** (*K. B.* 1915, 210, f. 5.) S. Stemless. Leaves 5–10 to a growth, 2-ranked, recurved-spreading, the inner 1½–3 ft. long, ⅔–1⅔ in. thick from front to back and ⅔–1¼ in. thick from side to side at the base, compressed-cylindric, with an acute channel much narrower than the leaf extending along the face from base to apex, hard and acute at the apex. Flower-stem 1¼ ft. long or more, bearing a spike-like raceme. Flowers 2–3 in a cluster, white. Probably British East Africa. (Kew.)

***Sansevieria Pearsonii.** (*K. B.* 1915, 216, f. 9.) S. Stemless. Leaves of adult growths 3–5, 2-ranked, gradually divergent from base to apex, 2¼–3 ft. long, 1⅓–1½ in. thick from front to back and 1⅙–1¼ in. thick from side to side at the base, cylindric, gradually tapering to a very acute point, with a channel on the inner face much narrower than the leaf and extending nearly to the apex, and 9–12 lines forming slight longitudinal grooves. Flower-stem unknown. South Angola and Damaraland. (Kew.)

***Sansevieria Perrotii.** (*K. B.* 1915, 206.) S. Stem erect, 6–8 in. high. Leaves 8–12 to a growth, 2-ranked, ascending or spreading, the inner 3–5 ft. long, ¾–1 in. broad near the base, with a deep concave channel as broad as the leaf throughout their length, very obtusely keeled or rounded on the back, hard and acute at the apex. Flower-stem 4 ft. high or more, paniculately branched above. Flowers in clusters of 2–4; tube pale greenish; lobes whitish inside, purplish outside. German East Africa. (Calcutta B. G.)

***Sansevieria Phillipsiae.** (*Hook. Ic. Pl.* t. 3000; *K. B.* 1915, 203.) S. Plant with short erect stems forming irregular clumps about 1–1¼ ft. high. Leaves usually 5–10 to a growth, finally very spreading and slightly recurved, 4–18 in. long, ½–¾ in. thick, cylindric, with 5–10 impressed lines or slight furrows extending from base to apex and a deeply concave sheathing portion 2–3½ in. long, hard, acute or obtuse at the apex. Flower-stem 14–18 in. high, bearing a spike-like raceme of flower-clusters. Flowers 3–6 in a cluster, white. British Somaliland. (Cambridge B. G.; Kew.)

***Sansevieria Powellii.** (*K. B.* 1915, 198, f. 1.) S. Stem erect, 3–4 ft. high. Leaves in 2 more or less spirally-twisted ranks, spreading, slightly recurved, 1–2¼ ft. long, ⅞–1⅛ in. broad, very convex but not at all keeled on the back, with a concave channel down the face as broad as the leaf, spine-like at the apex. Panicle about 18 in. long. Flowers 4–6 in a cluster, rather dingy greenish-white, marked with dull brownish-purple lines outside. British East Africa. (Kew.)

***Sansevieria Raffillii.** (*K. B.* 1915, 252, f. 22.) S. Stemless. Leaves of adult flowering plants 1–2 to a growth, with some sheaths surrounding their base, erect, rigid, 2–3¼ ft. long, 2¼–5 in. broad, ¼–⅓ in. thick, elongated-lanceolate or broadly strap-shaped, acute, sessile or with a short stout concave petiole, handsomely variegated when young. Flower-stem 3–3¾ ft. high, bearing a spike-like raceme 2–2½ ft. long. Flowers 2–5 in a cluster; tube 1–1⅛ in. long, greenish-white; lobes 1⅛–1⅙ in. long, white, British East Africa. (Kew.)

***Sansevieria Raffillii,** var. **glauca.** (*K. B.* 1915, 252.) S. Differs in several characters from the type, but chiefly in the bluish-glaucous leaves and lower part of the flower-stem. British East Africa. (Kew.)

***Sansevieria rhodesiana.** (*K. B.* 1915, 212, f. 7.) S. Closely allied to *S. Pearsonii*, but the leaves are not divergent, they do not taper nearly so rapidly, are more compressed, and the green lines on them are continuous and more evident. Rhodesia. (Kew.)

***Sansevieria robusta.** (*K. B.* 1915, 207.) S. Closely allied to *S. Ehrenbergii*, from which it may be distinguished by its taller stem and more numerous leaves. Stem 1–2 ft. high. Leaves 6–14 to a growth. British East Africa. (Kew.)

***Sansevieria singularis.** (*K. B.* 1915, 222.) S. Stemless. Leaves solitary, erect, rigid, 1½–8 ft. long, ¾–1¾ in. thick at the base, cylindric, slightly tapering upwards, acute, with 1 concave channel 1½–3 lin. broad and 1–1½ lin. deep down the face, and 4–6 impressed longitudinal lines on the sides and back which deepen into furrows with age. Flowers unknown. British East Africa. (Kew.)

***Sansevieria sordida.** (*K. B.* 1915, 214, f. 8.) S. Stem none or very short. Leaves 4–12 to a growth, 2-ranked, slightly spreading, very rough, 2¼–3½ ft. long, ½–¾ in. thick, from front to back and ⅓–½ in. thick from side to side at the base, slightly compressed-cylindric, tapering into a spine-like point, with an acute channel all along the face much narrower than the leaf and 11–15 or more grooves down the sides and back. Flower-stem 1–2 ft. high, bearing a spike-like raceme. Flowers 7–14 in a cluster, white and greenish, with minute purplish dots. Country unknown. (Kew.)

***Sansevieria subtilis.** (*K. B.* 1915, 237, f. 17.) S. Stemless. Leaves 2–4 to a growth, erect or slightly recurving, 1¾–2¼ ft. long, 1–1¾ in. broad, 1¼ lin. thick at the midrib, linear-lanceolate, gradually tapering from the middle or above upwards

into a subulate soft green point, and downwards into a channelled petiole. Flower-stem 15–21 in. long, bearing a lax raceme of flower-clusters. Flowers 2–3 in each cluster; tube 3–4 lin. long, slender; lobes linear, 5–6 lin. long, white. Uganda. (Kew.)

***Sansevieria suffruticosa.** (*K. B.* 1915, 202, f. 3.) S. Stems branching ½–3 in. above the ground, forming with the leaves clumps 2–2½ ft. high. Leaves 7–18 to a growth, ascending or spreading, ½–2 ft. long, ½–¾ in. thick, cylindric, usually with a concave channel extending from the sheath ¼–½ way up the leaf, spine-like at the apex. Flower-stem 1–1¼ ft. high, bearing a compact spike-like raceme. Flowers 2–5 in a cluster, whitish or greenish-white. British East Africa. (Kew.)

***Sansevieria trifasciata.** (*K. B.* 1915, 239.) S. This has been confused with *S. guineensis*, Willd., and is known also as *S. zebrina*, Gentil, *S. Jacquinii*, N. E. Brown, as well as under other names. Stemless. Leaves often 1–2, but in vigorous plants 2–6 to a growth, 1–4 ft. long, 1–2¾ in. broad, linear-lanceolate or narrowly elongated-lanceolate, acute but not hardened at the apex, transversely banded on both sides with different shades of green; petiole concave-channelled. Flower-stem 1–2½ ft. high, bearing a lax raceme of pale greenish flowers. Southern Nigeria. (Kew.)

***S. trifasciata,** var. **Laurentii.** (*K. B.* 1915, 240.) S. This is included in the list of 1904 under the name of *S. Laurentii*. It differs from typical *S. trifasciata* in having the leaves longitudinally striped with golden-yellow. Belgian Congo.

***Sansevieria varians.** (*K. B.* 1915, 209.) S. Cultivated for many years under the name of *S. zeylanica*. It is allied to *S. patens*, differing by its leaves being not nearly so stout, fewer to a growth, erect or ascending, and by having more flowers in a cluster. Country unknown, possibly Asiatic. (Kew.)

***Sansevieria zeylanica.** (*K. B.* 1915, 226.) S. This is the true plant. *S. zeylanica* met with in cultivation is often *S. aethiopica* or *S. Roxburghiana*. It differs from the former in having fewer leaves to a growth, and they are much longer and thicker, with a green instead of a whitish tip. Its flowers, too, are smaller. See *B. M.* t. 8487. Ceylon. (Kew.)

***Saxifraga Irvingii.** (*G. C.* 1915, lvii. 141, 158, f. 47; *Gard.* 1915, 152, f.) Saxifragaceae. H. Garden hybrid between *S. Burseriana macrantha* and *S. Friderici-Augustii*. (Kew.)

Saxifraga macrostigma, var. **cordifolia.** (*N. B. G. Edinb.* viii. 345.) H. Densely tufted. Stems leafy, densely covered with long white glandular hairs. Stem-leaves broadly cordate-ovate, 2½–3½ lin. long, 2–2½ lin. broad. Pedicels 1-flowered, densely glandular-pilose. Petals oblong-ovate, about 3½ lin. long. Yunnan, China. (Edinburgh B. G.)

***Saxifraga manshuriensis.** (*G. C.* 1915, lviii. 184, f. 62.) H. A perennial with a tufted habit similar to that of *S. rotundifolia*. Leaves orbicular, 3 in. across or more, fleshy; petiole long, covered with stiff hairs. Flowering-stems stout, 1–1½ ft. high, thickly covered with white hairs. Flowers in a dense rounded panicle, white, with orange-coloured stamens. Carpels ruddy pink. North-Eastern Asia. (Kew.)

Sedum Praegerianum. (*N. B. G. Edinb.* viii. 348.) Crassulaceae. H. A distinct new species remarkable in having the rose-coloured petals so erect that the flowers resemble those of an *Erica*. It is a perennial with an erect thick caudex. Flowering-stems 3–5 in. long, rather slender, simple, glabrous, red, more or less prostrate in the cultivated plants. Leaves alternate, linear-oblong, 4–4½ lin. long. Inflorescence somewhat corymb-like, 3–7-flowered. Corolla about ¼ in. long. East Himalaya. (Edinburgh B. G.)

***Sievekingia Shepheardii.** (*B. M.* t. 8635.) Orchidaceae. S. A new species distinguished by its 2-leaved pseudobulbs and erect many-flowered scapes. Leaves petiolate, elliptic-lanceolate, 5–8 in. long, 1¼–2 in. broad. Scape about 4 in. long. Flowers of medium size, yellow. Colombia. (Kew.)

Silene Wardii. (*Bees, Cat.* No. 48, 1914–15, 12.) Caryophyllaceae. H. A free-flowering plant somewhat resembling *S. Schafta* on a large scale. It grows about 1 ft. high and has a loose graceful habit and bright pink flowers. Western China. (Bees, Ltd.)

Silene westmoorensis. (*G. C.* 1915, lviii. 28.) H. Garden hybrid between *S. Hookeri* and *S. Elizabethae*. (R. Prichard.)

Sophro-cattleya Loddigesii. (*G. C.* 1915, lvii. 306.) Orchidaceae. G. Garden hybrid between *S.-c. Chamberlainiana* and *Cattleya labiata.* (Chamberlain Collection.)

Sophro-cattleya Maudiae. (*G. C.* 1915, lviii. 393.) G. Garden hybrid between *Sophronitis grandiflora* and *Cattleya Maggie Raphael.* (F. Sander & Sons.)

***Stachyurus chinensis.** (*G. C.* 1915, lviii. 147, f. 47; *Gard.* 1915, 182, f.) Ternstroemiaceae. H. Very closely allied to *S. praecox*, but the young twigs are not so brightly coloured, and the greenish-yellow flowers are less greenish and open a fortnight later. Central and Western China. (J. Veitch & Sons; Kew.)

Stelis Schenckii. (*Orchis*, 1915, 6, t. 1, ff. 14–19.) Orchidaceae. S. A rather robust many-stemmed species growing to a height of 10 in. Leaves obliquely ligulate, 3¾–5 in. long, ½–¾ in. broad. Sepals green, scarcely 2 lin. long. Petals and lip dark purple, only about ½ lin. long. Brazil. (Darmstadt B. G.)

***Stewartia sinensis.** (*Pl. Wils.* ii. 395.) Ternstroemiaceae. H. Shrub or small tree with erect-spreading branches. Leaves membranous, oblong-elliptic or obovate-elliptic, acuminate, more or less toothed, 2½–4 in. long, ¾–1¾ in. broad. Flowers axillary, solitary, cup-shaped, white. Petals broadly obovate, 1–1¼ in. long. Central China. (J. Veitch & Sons.)

***Streptocarpus denticulatus.** (*B. M.* t. 8632.) Gesneraceae. G. A new species of the section *Unifoliatae.* Leaf ovate, cordate at the base, sometimes 8 in. long, 7 in. broad, glabrous or nearly so. Inflorescences clustered, 9–10 in. high, many-flowered, densely glandular-pubescent. Corolla rose-purple with a white tube and purple blotches and crimson streaks on the limb; tube cylindric, narrowed in the middle, ⅓ in. long; limb 2-lipped, 5-lobed; lobes over ¼ in. long. Transvaal. Cambridge B. G.)

***Streptocarpus Taylori.** (*G. C.* 1915, lviii. 293, 312, f. 103.) G. Garden hybrid between *S. achimeniflorus albus* and *S. denticulatus.* (Kew.)

Thlaspi bulbosum. (*G. M.* 1915, 288.) Cruciferae. H. A pretty little plant, 5–6 in. high, with bulbous rootstock, sessile ovate stem-leaves auricled at the base, and purplish flowers in loose racemes. Greece. (S. Arnott.)

***Tilia intonsa.** (*Pl. Wils.* ii. 365.) Tiliaceae. H. This was included in the list of 1913 under the name of *T. tonsura.* It is closely related to *T. chinensis*, but is distinguished from it and all other Chinese species by its hairy shoots. Western China. (J. Veitch & Sons.)

Trachycarpus caespitosus. (*B. T. O.* 1915, 164, f. 11.) Palmae. H.H. A new species remarkable for its tufted habit, in this respect resembling *Chamaerops humilis*, but the secondary stems instead of growing up at an angle with the main stem are parallel to it and form a dense bush 8–11 ft. high. Probably China. (Sunset Park. Los Angeles. California.)

Vanda Burgeffiana. (*Orchis*, 1915, 180.) Orchidaceae. S. Garden hybrid between *V. tricolor* and *V. coerula.* (H. Jancke, Berlin.)

***Vanda luzonica.** (*G. C.* 1915, lviii. 313; *O. R.* 1915, 137, f. 12.) S. Habit similar to that of *V. tricolor*, but the species is more nearly allied to *V. insignis* and has flowers about the same in size. Spike 6–12-flowered, erect. Sepals and petals clear white with a thin purple line on the basal parts behind the column. Side lobes of the lip whitish with some dark markings; front lobe violet-purple. Luzon, Philippine Islands. (F. Sander & Sons.)

Viola septentrionalis alba. (*G. C.* 1915, lvii. 282.) Violaceae. H. Flowers 1 in. across, white, lined towards the eye with blue. Upper petals broad and spreading. (Miss Leonard.) *V. septentrionalis*, Greene, native of Ontario, Canada, is a stemless plant, with reniform or round-cordate leaves and pale violet flowers 9–10 lin. long and broad. See *Greene, Pittonia*, iii. 334.]

Washingtonia filifera, var. **microsperma.** (*B. T. O.* 1915, 15.) Palmae. G. Leaves rather smaller than in the type, with petioles almost quite unarmed except at the base. Flowers, fruits and seeds also smaller. (Lady Hanbury, La Mortola, Italy; &c.)

Washingtonia robusta, var. **gracilis.** (*B. T. O.* 1915, 18.) G. Leaves about 4½ ft. long, with 70 segments which are very slightly filiferous on the margin; petiole about as long as the leaf, armed with small fine spines. The flowers differ from those of the type in the shorter less distinctly laciniate-ciliate lobes of the calyx and in other characters including the length of the style, which is as long as the stamens. (Lady Hanbury, La Mortola; Naples B. G.; &c.)

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